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SENSITIVE PLANT SURVEY IN THE SWEETGRASS HILLS, LIBERTY AND TOOLE COUNTIES, MONTANA

BUREAU OF LAND MANAGEMENT

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EXECUTIVE SUMMARY

New information on four sensitive plant species was collected in surveying Sweetgrass Hills lands administered by the Bureau of Land Management (BLM), as follows:

Claytonia lanceolata var. flava was found in abundance on both East and West Butte, further corroborating recommendations that it be dropped from state and federal consideration. Recent taxonomic research provides the basis for resolving previous questions on verification of Sweetgrass Hills material.

Halimolobos virgata was relocated on an East Butte BLM tract and a new population site located incidental to surveys. It is adventive at the original site on BLM land but a natural vegetation component at the second site on private land; further investigation into species' status is warranted.

Ranunculus cardiophyllus was relocated on the West Butte and found at a new site. The two sites do not extend onto BLM-administered lands.

Ranunculus pedatifidus was discovered for the first time on West Butte where it is in a marsh swale basin on BLM-administered lands.

Two of the four species above are montane or subalpine species, whose presence in the small outlying montane landforms represented by the Sweetgrass Hills is taken to further represent the relict nature of the flora and reflect its diversity.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

The relict nature of the montane and subalpine flora of the Sweetgrass Hills has been considered (Thompson and Kuijt 1976), and a survey conducted in the Sweetgrass Hills for sensitive plant species on BLM lands (Western Technology and Engineering, Inc. 1989). The purpose of this study was to address sensitive plant species questions raised in these earlier investigations. Sensitive plant species questions concerned the nature and extent of twiggy halimolobos (Halimolobos virgata) and heart-leaved buttercup (Ranunculus cardiophyllus) populations and habitat. In addition, question had been raised as to the identification of the putative Claytonia lanceolata var. flava previously collected from the Sweetgrass Hills, and its taxonomic and protection status. Ancillary objectives were to augment existing botanical characterizations of the Sweetgrass Hills.

II. STUDY METHODS

Prior to fieldwork, the Biological Conservation Database maintained by the Montana Natural Heritage Program was queried for records of BLM proposed sensitive and watch species (USDI Bureau of Land Management 1993) known from the Sweetgrass Hills vicinity (Table 1). All of these had also been reported in the study by Western Engineering and Technology, Inc. (1989), except for one wetland species, the long sheath waterweed (Elodea longivaginata), collected from a nearby prairie pothole. The study area has not been intensively studied botanically, so while survey focused on known plants proposed for BLM sensitive or watch status , consideration was given as well to any state species of concern (Heidel and Poole 1993).

Table 1. Sensitive species targets in the Sweetgrass Hills area

Scientific name/ Common name	BLM status	Heritage ranks*
Claytonia lanceolata var. flava Yellow springbeauty	none	G5T1? S3
Elodea longivaginata Long-sheathed waterweed	none	G4G5 S1
Halimolobos virgata Twiggy halimolobos	watch	G2G3 S1
Ranunculus cardiophyllus Heart-leaved buttercup	watch	G4 S1

White forms of Claytonia lanceolata var. flava had been collected in the earlier sensitive plant study (Western Engineering and Technology 1989), and taxonomic research had been in progress to verify help determine whether white forms are the same variety as the more widespread yellow forms of C. l. var. flava. This taxon represents unique biological and conservation status circumstances (described on p. 12).

BLM-administered lands in the Sweetgrass Hills were surveyed for sensitive species on 29-30 May, 9-11 June and 7-11 July. The area was traversed on foot in relocating known sensitive species, searching for other potentially suitable habitat for these species, and visiting all major habitat types and the range of environmental conditions as potentially harboring other sensitive species. Appendix A is a map showing principle travel routes.

Sensitive plant information was collected on sensitive plant survey forms documenting population size, setting, location, and conditions. Photographs (35 mm slides) were taken of the plants and their habitats as weather permitted. Lists were made of all vascular plant taxa which could be identified. Specimens of sensitive species and other collections will be deposited at the herbarium at the University of Montana (MONTU). Identification was made using Hitchcock and Cronquist (1973) and Dorn (1984). Identification questions were pursued in the office using a dissecting scope. Verification by taxonomic experts was sought for Claytonia lanceolata var. flava, verified by J. Stephen Shelly (U.S. Forest Service - Regional Office, Missoula) and for both Ranunculus cardiophyllus and R. pedatifidus, verified by Ron Hartman (Rocky Mountain Herbarium, University of Wyoming, Laramie).

Landowners were contacted for access permission. All but one access point from county roads involved crossing private property, so private lands were traversed though there was no systematic survey done on them.

III. STUDY AREA

The Sweetgrass Hills are three isolated buttes and associated ridges located in northcentral Montana near the Alberta border in Liberty and Toole counties, ca. 140 km (100 miles) east of the Rocky Mountain Front Range (Figure 1. Sweetgrass Hills study area). As prominent landmarks, they abruptly jut over 800 m (2500 ft) above the surrounding plains. They cover a total area of ca. 3,220 ha (8000 acres), collectively referred to as the Sweetgrass Hills, highly discontinuous across a 34 km (20 mile) distance. The East and West Buttes are higher and larger than Gold Butte (also called Middle Butte), with much more forest cover and BLM-administered land than Gold Butte, and were the focus of this study.

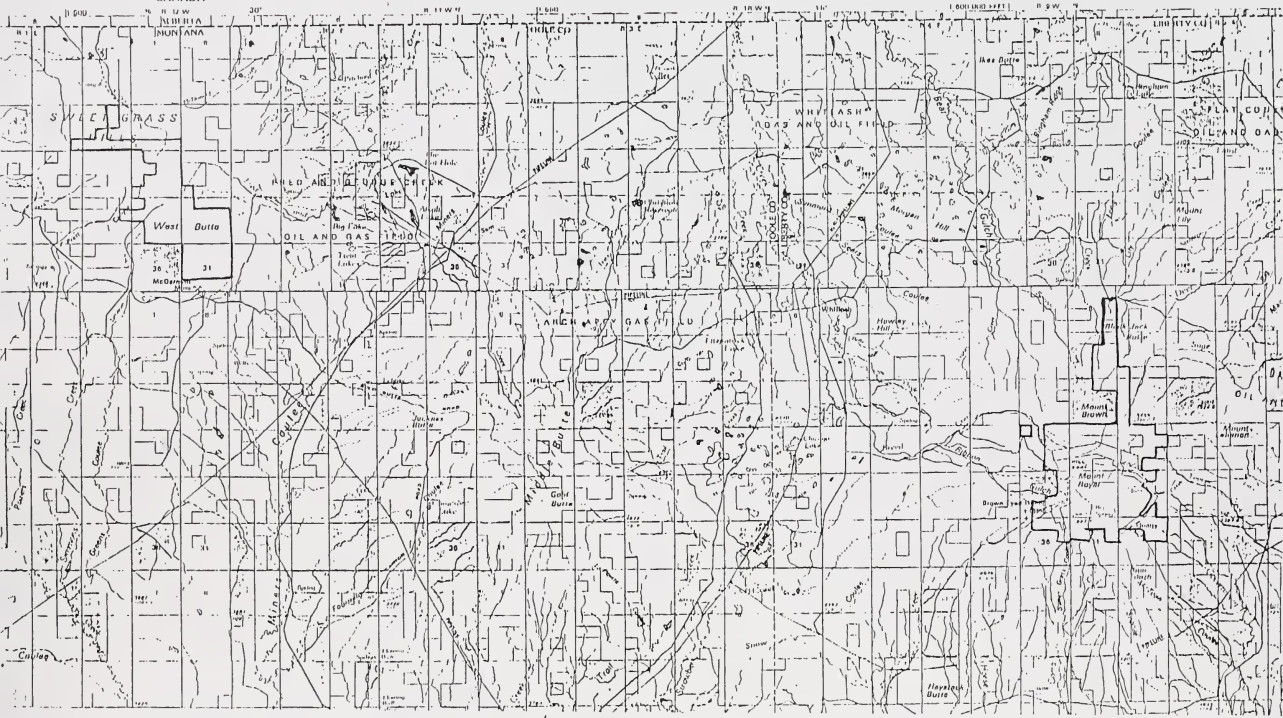
The Sweetgrass Hills are the most isolated of Montana's island mountain ranges in their small size and landform discontinuity. Yet they have an exceptionally diverse flora and vegetation that include components typically spanning a wide range of elevations and hydrological conditions. The study area descriptions which follow highlight previously compiled information, and supplementary information for understanding the sensitive species significance and setting uniqueness. The Sweetgrass Hills landmark name implicitly refers to the three buttes, the focus of this and previous studies. Reference to the Sweetgrass Hills in the following text will implicity refer to these landforms unless otherwise stated.

Surface management of the Sweetgrass Hills is split between public and private ownership (Figure 1. Sweetgrass Hills study area). The Bureau of Land Management administers the largest single land units on top of East and West Buttes, totaling roughly 5780 acres (2340 acres), spanning much of the high elevation habitat. They East and West Butte BLM tracts are continuous, though intersected by private holdings. The only other public lands in the Sweetgrass Hills are administered by the Department of State Lands. Most private holdings are part of ranching operations that are continuous with the surrounding plains, or else small mining parcels.

Livestock production is the most widespread land use, and takes place throughout the widely-accessible Sweetgrass Hills on both private and public land where there is forage. The area had been selectively logged for fuel and construction material for surrounding residences in decades past. New clearcuts are also appearing on private lands, as noted above Breed Creek on East Butte. The area has a history of mining that goes back to the discovery of gold on Gold Butte in 1884. Numerous oil and gas fields have also been developed at the fringes of the Sweetgrass Hills and surroundings.

Bureau of Land Management lands on East and West Buttes have been designated as an Area of Critical Environmental Concern (ACEC) based on the biogeographic and biodiversity significance documented in previous studies (Thompson 1978, Thompson and Kuijt 1976, Western Engineering and Technology 1989).

Figure 1. Sweetgrass Hills study area



Geology and Paleoecology

The Sweetgrass Hills originated during Tertiary mountain-building activity as three igneous intrusions, i.e. lacoliths, that penetrated sedimentary deposits, and have subsequently been exposed at the surface. The highest summits are dome-shaped lacoliths, including the West Butte summit and the twin peaks of East Butte, Mt. Royal and Mt. Brown, composed of Tertiary intrusive rock consisting mainly of syenite-diorite porphyry. The summits are made up of, exposed as coarse sharp-edged talus rather than bedrock outcrop. The flanks of all three buttes are Colorado Shale (Ross et al. 1955) with few outcrops. In addition, East Butte has extensive areas of Madison Group limestone, and Kootenai Formation sandstone, shale and mudstone. West Butte has small areas of Eagle sandstone and the Madison Group limestone surface geology.

The igneous bedrock of the Sweetgrass Hills were more resistant to the weathering affects of wind and water as well as the abrasion of glaciers, compared to the prevailing sedimentary bedrock. The Sweetgrass Hills were completely surrounded and overtopped by glaciers about 54,000 years ago, shaping the north-south trending ridge systems. It was noted that melting glaciers left behind giant boulders in places, i.e., glacial erratics, and that some of these granitic erratics also bear the marks of giant floods, with deep globe-shaped potholes scoured into their surface. In subsequent glacial episodes, the Sweetgrass Hills effectively represented islands above the ice sheets during the more recent advances. These islands, or "nunataks", provided habitat set apart from the surrounding plain at some stage in glaciation. It has been suggested that migrating belts of coniferous forest recolonized these islands following the receding ice sheet (Thompson and Kuijt 1976). In keeping with this hypothesis, it was noted that the surrounding plains have abundant potholes and closed drainage topography, representing areas of stagnation moraine topography where glaciers were mantled by deep layers of till, and suggesting that the most recent glaciers melted in situ. In this paleoenvironment, regardless of whether or not the nunataks were open or covered by snow and ice, such till deposits as would have surrounded the Hills have been known to support boreal floras (Love 1959). The Sweetgrass Hills montane and subalpine flora may have persisted locally, so that it is not necessary to invoke forest migrations of hundred-mile distances in this paleoenvironment model. If montane and subalpine flora persisted in the immediate Sweetgrass Hills vicinity during the most recent glaciation, then the Sweetgrass Hills is a refugia in the strictest sense, with local shifts in species' distribution patterns accompanying the major climate changes.

During an interval of climate warming about 5,000 years ago, elements of Great Plains and Great Basin floras expanded their range north, establishing or increasing their presence on the tillplains and alkali bedrock outcrops surrounding the Sweetgrass Hills. It appears that many of the alkaline outcrops correspond with Eagle Sandstone Formation along Eagle Creek and some Willow Creek tributaries. This

Formation has the most xeric habitat locally, and is more or less continuous from north to south across half of Montana. The closed drainage topography in areas of the till plains further concentrates salts at the watershed centers, so that a full spectrum of freshwater to brackish water conditions are represented in a prairie pothole mosaic.

Soils

Soil classification and mapping has not been published for the Sweetgrass Hills. Soil orders represented include mollisols, alfisols and entisols, with udic and ustic moisture regimes, and a prevalent frigid temperature regime, mapped in the general state soil map as a combination of cryoborolls, cryoboralfs, and haploborolls (US Soil Conservation Service 1978). Large areas on the highest peaks, including most forested habitat, have limited soil development and are provisionally mapped as Rubbleland-Cowood complex. Soil development is strongly influenced by local climate, topography, and parent material.

Climate

Temperature and precipitation data is available from the nearest U.S. Department of Commerce - National Oceanic and Atmospheric Administration recording station in Chester (U.S. Department of Commerce 1982). The Chester area has a continental climate with low precipitation, cold winters and hot summers. Mean annual precipitation is an average 11.8-13.8" (30-35 mm; from Thompson and Kuijt 1976). Though there are no recording stations in the Sweetgrass Hills, estimates have placed it at twice the level of annual precipitation in Chester, i.e., 23.6-27.6" (60-70 mm) per year (Thompson and Kuijt 1976). The soils series of the Sweetgrass Hills which are being mapped by the Soil Conservation Service are ones that typically fall within a 15-19" zone (USDA in progress), but this is a very rough estimate. A computer-generated state annual precipitation map shows the Sweetgrass Hills falling within a 14-40" range (Caprio and Nielsen 1992).

Weather conditions of the 1993 growing season were somewhat warm and dry in spring, with local reservoirs at low levels (McDermott pers. commun.). Conditions became exceptionally cool and wet during the remainder of the growing season, bringing local reservoir levels above normal. Over the course of one day, on June 12, a nearby ranch recorded 8" of rainfall. On July 12, snow blanketed East and West Butte summits.

Flora

A total of 403 species of vascular plants have been collected or reported from the Sweetgrass Hills. The preliminary flora of the area was documented by Thompson and Kuijt (1976), expanded in the first sensitive species study (Western Technology and Engineering, Inc. 1989) and augmented in this study. This includes additions and at least one deletion in the list of alpine and subalpine plants of the Sweetgrass Hills (Western Technology and Engineering, Inc. 1989).

East and West Buttes have differences in their floras that may correspond with substrate differences. Preliminary efforts were made in characterizing the distinctions by noting which taxa occur on which butte, augmented in transcribing information from the incomplete copies of field collection records of Larry Thompson (in progress).

There are likely to be significant numbers added to this flora with further study, so it is still referred to as a preliminary flora. An addition of 64 species was made through this project, representing almost no late-flowering activity. Flowering of early-flowering plants under the 1993 weather conditions was profuse and prolonged into the middle of summer. July 12 marked the last day of 1993 fieldwork in the Hills.

Previous works characterized the biogeographic affinities of the Sweetgrass Hills flora as divided between the Rocky Mountains and Northern Great Plains influences (Thompson and Kuijt 1976, Western Technology and Engineering 1989). In addition, there is a distinct Great Basin influence, lying mainly outside of the study area, and particularly developed in communities dominated by greasewood (Sarcobatus vermiculatus), silver sage (Artemisia cana) and long-leaved sage (Artemisia longifolia). There are also small components of Columbia Basin, boreal, and eastern deciduous woodland affinities, as well as widespread wetland plants whose center of distribution, much less of origin, are unknown. Further investigation into the biogeographic affinity of the Sweetgrass Hills is warranted.

The previous list of alpine and subalpine plant taxa which may represent range extensions in the Sweetgrass Hills warrants editing and expansion, and the entire floristic list edited to indicate which species are represented by voucher specimens.

Vegetation

Vegetation of the Sweetgrass Hills has been described in general physiognomic terms and by forest dominance types (Thompson and Kuijt 1976, Western Technology Engineering, Inc. 1989), further characterized as to elevation range and area extent (Thompson 1978). The Sweetgrass Hills have not been included in any statewide forest, prairie or riparian sampling studies or classifications except for a study plot taken from the Gold Butte Cemetery ("Middle Butte") in Festuca scabrella/Stipa viridula habitat by Ross et al. (1973) as part of the effort to characterize state range sites and range site potentials. There have been preliminary efforts to enumerate the vegetation series, habitat types and community types of the Sweetgrass Hills in comparison with other outlying ranges of the region (Western Technology and Engineering, Inc. 1989). The following observations augment these general community descriptions.

Upper elevation mesic slopes are predominantly Festuca scabrella habitat types w/wo codominance by Potentilla fruticosa, referred to as the montane grassland by Thompson and Kuijt (1976). The exceptional

condition, diversity, and productivity of this vegetation throughout most of the study area was noted. It is an expression of the localized climate conditions found on the buttes, with their additional precipitation, cooler temperatures, and high cloud cover ("cloud prairie"). Localized plant associations within this habitat were noted including areas dominated by species not recognized among the existing plant community classification.

High elevation grasslands are referred to as subalpine grassland by Thompson and Kuijt (1976) and deserve sampling documentation. They are found on West Butte, Mount Royal, and the saddle between Mount Royal and Mount Brown, and have a short, stunted physiognomy compared to the montane grassland. The East Butte summit areas are rough fescue h.t. and are grazed, but the ungrazed West Butte summit appears to have Poa rupicola h.t. as well, a discrete subalpine grassland association.

Lower slopes of montane grassland and surrounding plains have soils with different textures and chemistry on East vs. West Butte corresponding with parent material difference. Their resulting vegetation differences are undocumented and offer a prospect for comparing parent material influence on vegetation.

Forest habitats are very limited in the Sweetgrass Hills, but have a diversity of types including dominance or codominance by Psuedotsuga menziesii, Pinus flexilis, Pinus contorta, Picea englemanni x glauca and Abies lasiocarpa. Types characterized by deciduous tree dominance are even more uncommon but have discrete plant associations, with dominance including Populus tremuloides, and riparian communities of Populus deltoides and Populus trichocarpa.

There has been publication of pre- and post-settlement fire history as well as pre- and post-settlement land use history to my knowledge, and such background information is needed to understand the vegetation. For example, the south-facing flanks of West Butte had what appear to be savanna conditions of tall, widely-spaced Pseudotsuga menziesii with grassland understory, but all that are left are the huge stumps and a few of the old trees left on a slope which is becoming overgrown with brush and small trees. Extensive, even-aged "rubble slope forests" also offer interesting succession study.

In general, the vegetation associated with the wet end of the catena has not been examined in the Sweetgrass Hills. Wet meadows, springs, and seeps make up a small proportion of the area but have well-developed plant communities and contribute significantly to floristic diversity. Miles of streamcourse margins have saturated soils that represent stable environments for many high elevation taxa like Phleum alpinum that venture into the foothills. Oxbows and beaverponds are found on one or more of the riparian systems.

Ethnobotany

The name "Sweetgrass Hills" refers to the native grass species with that common name (Hierochloe odorata), according to local residents (McDermott pers. commun.). This grass was widely used in ceremonies and as purifying fragrance by indian peoples inhabiting what is now Montana (Hart 1991). This grass species was observed in low numbers at only three West Butte locations near the butte base along watercourses or meadow margins (Heidel #1019 MONTU). A report of it growing on private property beyond the butte areas was not investigated. The sweetgrass observed near West Butte was relatively vigorous for this species, its flowering stem growing relatively tall (ca. 4 dm.), perhaps increasing its cultural value. It is very limited in its present extent, so either this grass as namesake was an uncommon butte species of exceptional value, was once common in the butte areas but has declined with land uses changes, or was primarily outside the butte areas in the intervening plains.

There was no attempt to catalogue potential plant uses in the Sweetgrass Hills, but a copy of the flora has been compared against available tabulations of plants having traditional plant uses (Kooistra-Manning et al. 1993) at the request of BLM (Appendix 3). It was observed that local native plants had notable sweetness and tenderness, including Astragalus crassicarpus fruits, Claytonia lanceolata leaves, and Lomatium cous tubers. There has been no published research of area ethnobotany.

IV. RESULTS

Four sensitive species were documented in the Sweetgrass Hills:

* New discovery of Ranunculus pedatifidus
* Relocation and additional site of Halimolobos virgata
* Relocation and addition site of Ranunculus cardiophyllus
* Verification of extensive Claytonia lanceolata var. flava

The presence of each target species in the Sweetgrass Hills represents a disjunct distribution, and the site information that was collected adds breadth to their known ecological amplitude in Montana.

Only Claytonia lanceolata var. flava was found at both East and West Buttes in relative abundance. Otherwise, East Butte was documented with two sites for Halimolobos virgata, and West Butte was documented with two sites for Ranunculus cardiophyllus and one for Ranunculus pedatifidus (Figure 2; excluding Claytonia lanceolata var. flava distribution).

All four target species are in open habitats, otherwise differing in habitat specificity. The Claytonia lanceolata var. flava grows in mesic upper montane grassland typically dominated by rough fescue (Festuca scabrella), and some lower elevation microhabitats or ecotones that are also cold and seasonally moist though very different in their vegetation. The Ranunculus cardiophyllus is found in meadow habitats associated with watercourses, appearing restricted to the foothills flanks above localized groundwater discharge zones at the wet end of the gradient dominated by rough fescue (Festuca scabrella). The Ranunculus pedatifidus is also in a foothills setting. Though the wetland vegetation in which it occurs is highly altered, it appeared to be associated with tufted hairgrass (Deschampsia cespitosa) meadow. Habitat of Halimolobos virgata is in dry foothills settings, the apparent restrictiveness of it within this very widespread habitat warranting further investigation.

Survey results are not taken to represent every possible sensitive species occurrence, but a filling in of gaps identified from previous survey work, and a baseline for conducting any site-specific evaluations.

Figure 2. Location of Sweetgrass Hills sensitive plants

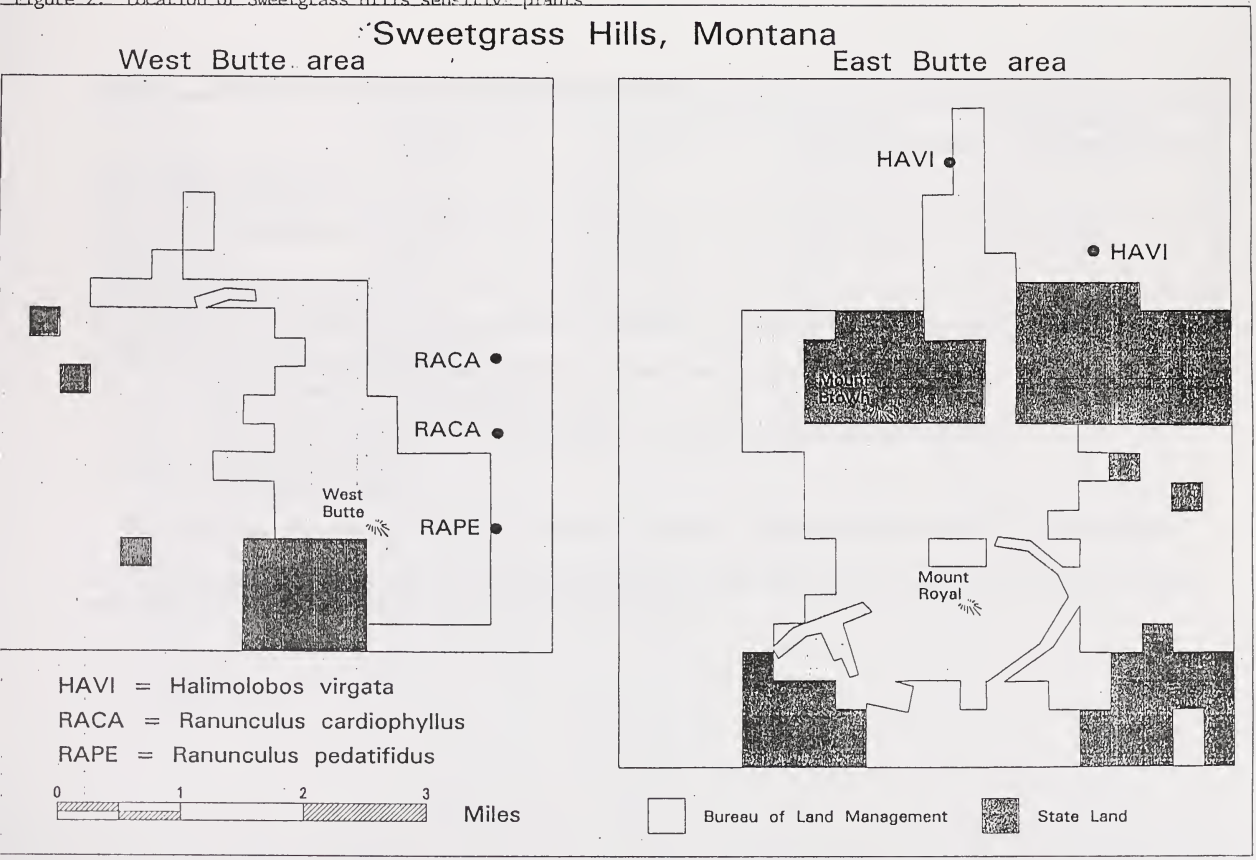


Table 2. Sensitive species status recommendations

Species	Current BLM status	Recommended BLM status	Current Heritage ranks*	Recommended Heritage ranks*
Claytonia lanceolata var. flava	none	none	G5T1? S3	G5 S3
Halimolobos virgata	watch	watch	G2G3 S1	G3 S1
Ranunculus cardiophyllus	none	watch**	G4 S1	G4 S1
Ranunculus pedatifidus	none	watch**	G5 S1	G5 S1

Global/state ranking standards

* G1 S1 Critically imperiled because of extreme rarity or threats; usually five or fewer occurrences
G2 S2 Imperiled; usually 6-20 occurrences
G3 S3 Vulnerable by reason of low numbers or narrow distribution; usually 21-100 occurrences
G4 S4 Apparently secure
G5 S5 Demonstrably secure

"T" following the global rank of a species refers to separate global rank of the variety

** These species are not known on BLM-administered lands but are in close proximity such that management actions potentially affect the species.

Claytonia lanceolata var. flava
Yellow spring beauty

Note: The following represents an update to the status information on Claytonia lanceolata var. flava as presented in Shelly (1989a, 1989b), and focuses on Sweetgrass Hills conditions.

A. CLASSIFICATION

1. **SCIENTIFIC NAME:** Claytonia lanceolata var. flava (A. Nels.) C. L. Hitchc.; see species taxonomy discussion below.

2. **COMMON NAME:** Yellow springbeauty

3. **FAMILY:** Portulucaceae (Purslane Family)

4. **GENUS:** Claytonia (Spring beauty, claytonia)

5. **SPECIES AND VARIETY:** lanceolata var. flava is the treatment given Montana material in all existing floras. Two questions pertaining to this taxon are in the process of being resolved, and both have bearing on its status.

   In Montana are pure and mixed populations that have all the characteristics of C. l. var. flava except for having white flowers instead of yellow flowers, as the common name infers. All Sweetgrass Hills plants are white-flowered. Electrophoretic and morphological studies have revealed that the color forms are genetically identical (Shelly et al. in progress). This lends support to considering the taxon more common than previously known in Montana.

   Furthermore, in comparing these Claytonia lanceolata var. flava specimens with material in the C. lanceolata complex, it was determined that this taxon does not belong in the complex (Shelly et al. in progress). Separate concurrent monographic revisions are in progress which subsume C. lanceolata var. flava in a more common species of Claytonia (Shelly pers. commun.) of arctic origin that is not otherwise considered to be in Montana. It will be referred to in this report and communications as C. lanceolata var. flava until such time as the revisionary taxonomic work is published.

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. **FEDERAL STATUS**

a. **U.S. FISH AND WILDLIFE SERVICE:** The putative Claytonia lanceolata var. flava was treated as an additional species target only because the taxa had been and remains on the U.S. Fish and Wildlife Service Notice of Review list in Category 2 as a

candidate for listing consideration (FR NOR Vol. 55 No. 35 of 21 Feb. 1990; FR NOR Vol. 58 No. 188 of 30 Sept. 1993 - 51144-51190). For the reasons described under species' taxonomy, Claytonia lanceolata var. flava belongs in both the "3B" category (invalid taxon) and the "3C" category (more widespread than previously known).

b. **U.S. BUREAU OF LAND MANAGEMENT:** No proposed status (USDI Bureau of Land Management 1993). It had not been documented from BLM-administered lands prior to this study.

c. **U.S. FOREST SERVICE:** Sensitive designation (USDA Forest Service - Region 1 1991, as represented in Lesica and Shelly 1991). Recommended for deletion from sensitive designation in pending list update (Shelly pers. commun.)

2. **STATE:** It is currently ranked as "S3" by the Montana Natural Heritage Program, meaning that it is not imperiled, though it may be vulnerable.

C. **DESCRIPTION**

1. **GENERAL NONTECHNICAL DESCRIPTION:** Claytonia lanceolata var. flava is a small perennial herb with stems that arise from deep-seated corms bearing two opposite narrow stem leaves which are much longer than wide (ca. 1/4 to 1/2 inch wide to 2-4 inches long). The flowers are borne in groups of two to twelve and are yellow or white (Figure 3). Flowers are either yellow, or else white as found in the Sweetgrass Hills.

Figure 3. Close-up of Claytonia lanceolata var. flava from Fred and George Creek area, West Butte

2. **TECHNICAL DESCRIPTION:** See Shelly (1989a). Verification of all Sweetgrass Hills material was provided by J. Stephen Shelly.

3. **LOCAL FIELD CHARACTERS:** Claytonia lanceolata var. flava is the only member of the Purslane Family found in the Sweetgrass Hills. There are no other perfect white flowers having only two sepals; the leaf and corm features in combination are also diagnostic.

D. GEOGRAPHICAL DISTRIBUTION

1. **RANGE:** Its described range will be expanded with monographic revision that is expected to merge it with a more widespread taxon.

2. **CURRENT SITES:** Claytonia lanceolata var. flava is known from 37 sites in Montana spanning 15 counties, including extensive populations among these sites. The highest concentration of known sites is in southwestern Montana. Its northernmost documented Montana sites, apart from the Sweetgrass Hills, are in the Little Belt Mountains over 160 km (100 miles) to the south. Its distribution and other Sweetgrass Hills field data was transcribed and mapped, but not retained in the database.

3. **HISTORICAL SITES:** The first collection of Claytonia lanceolata var. flava was made by Lewis and Clark (Phillips pers. commun.), and cannot be relocated with precision.

4. **UNVERIFIED/UNDOCUMENTED REPORTS:** It has been reported that this taxon was seen near the Little Rocky Mountains (Roe pers. commun.) but a voucher specimen was not collected. If verified, this would represent an occurrence as much or more disjunct than that in the Sweetgrass Hills.

5. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** The taxon's potential habitat was most extensively surveyed in early July after verification had been made of material collected in May and June. While it was located on a couple occasions in fruit in July, it could not be reliably located without flowers this late in the season, and it was impossible to estimate numbers or extent. From limited May and June survey work in rough fescue habitat, in which this species was found repeatedly, it is suggested that the taxon may be widespread in the mesic grasslands which prevail at upper elevations and north-facing slopes.

E. HABITAT

1. **ASSOCIATED VEGETATION:** This early-blooming taxon was found in a variety of open and semi-open mesic habitats, including major and minor plant associations and ecotones. It was found in many areas of Festuca scabrella grassland, which prevails across north-facing slopes and upper elevations. It also flourishes in the small patches of deciduous tree and shrub cover, particularly

among Populus tremuloides, along foothills watercourses. It is also in well-drained valleybottom margins of evergreen forest and adjoining meadow.

2. **TOPOGRAPHY:** In the Sweetgrass Hills it spans a wide range of topography from the base of the buttes to the lower borders of the talus-ringed summits. It was most consistently found on gentle north-facing slopes, but occurred at every aspect over a range of slope angles. The lowermost Sweetgrass Hills subpopulations are at about 4600', almost 2000' lower than the minimum elevation elsewhere in Montana, and in a relatively wide range of settings (Shelly 1989a).

3. **SOIL RELATIONSHIPS:** Soils are well-drained loams that varied considerably in soil depth, organic matter content and parent material. It was not restricted to the heavy clay loams with which the taxon is associated elsewhere in its range (Shelly 1989a).

4. **REGIONAL CLIMATE:** This taxon depends on moist, stable spring conditions of a cool, temperate climate. It was observed that the Sweetgrass Hills deviate from the surrounding regional plains climate in relatively high cloud cover and precipitation, representing a pocket of suitable climate favorable for this species. It typically occurs in settings of snow accumulation elsewhere in its range.

E. **SUMMARY:** Occurrence of Claytonia lanceolata var. flava in the Sweetgrass Hills represents the northernmost record in Montana. It is completely composed of the white flower form rather than yellow form, the two forms now recognized as being genetically identical. Its current treatment as a variety of C. lanceolata will be changed and it will be subsumed in a widespread species of arctic origin. Its local abundance and range disjunction augment the biodiversity picture emerging in the Sweetgrass Hills, though sensitive species recognition is not appropriate for it at this time.

This report contains the most complete and current available information compiled on the status of Claytonia lanceolata var. flava in Montana. This information is to be conveyed to the U.S. Fish and Wildlife Service in reconsidering its status as a possible candidate for designating as threatened or endangered.

Halimolobos virgata
Twiggy halimolobos

A. CLASSIFICATION

1. **SCIENTIFIC NAME:** Halimolobos virgata (Nutt.) O. E. Schulz

2. **COMMON NAME:** Twiggy halimolobos

3. **FAMILY:** Brassicaceae (Mustard Family)

4. **GENUS:** Halimolobos (no common name); was originally placed in the genus Arabis. It is closely related to the genus Sisymbrium in having siliques which are terete or very nearly so, wingless seeds, and incumbent cotyledons. It is distinguished in having multi-branched trichomes that make up a canescent pubescence; the siliques are often densely pubescent as well (Rollins 1943).

5. **SPECIES:** H. virgata (Lat. twiggy); closely related to H. mollis, an arctic species.

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. **FEDERAL STATUS**

a. **U.S. FISH AND WILDLIFE SERVICE:** None

b. **U.S. BUREAU OF LAND MANAGEMENT:** Watch

c. **U.S. FOREST SERVICE:** None

2. **STATE:** Prior to this study, Halimolobos virgata was given an "S1" state rank of critically imperiled. From this study and concurrent survey in the Tendoy Mountains (Vanderhorst and Lesica 1994), as well as review subsequent to the Tendoy Mountains report, it is being kept with an "S1" state rank based on five current records.

It is strictly adventive in one of the five current records for this species, but is otherwise dependent on natural habitat. Its habitat is characterized as "open plains and foothills, sometimes becoming weedy" (Hitchcock et al. 1964). If there are other sites at which it is restricted to unnatural disturbance settings, then the appropriateness of maintaining it on the state list of species of concern will be re-evaluated.

The presence of Halimolobos virgata in native prairie habitat of the Sweetgrass Hills, as well as in the biogeographically similar Cypress Hills (Rollins 1943) contributes to a conservative state rank.

C. DESCRIPTION

1. **GENERAL NONTECHNICAL DESCRIPTION:** Biennial or short-lived perennial herb with a single branched or unbranched stem; 1-4 dm high. It has a basal rosette of leaves, and sessile, clasping stem leaves that are slightly serrated. The stems are pubescent above. The white flowers are small but numerous. The fruits are erect (Figure 4).

2. **TECHNICAL DESCRIPTION:** Biennial or perennial; stems usually single from a simple caudex, branched above or below, erect or ascending, 1-4 dm. high, hirsute below with a mixture of large and small trichomes, pubescent above with small appressed trichomes; basal leaves narrowly oblanceolate, sinuate-dentate, petiolate, densely pubescent with dendritic trichomes, 2-6 cm. long, 5-10 mm. wide; cauline leaves sessile, auricled, remote, lanceolate, densely pubescent, 1.5-4 cm. long, 2-7 mm. wide; infloresence fairly lax; anthers about 0.5 mm. long, broadly oblong; nectar-glands weakly developed, continuous beneath all stamens; sepals nonsaccate, hirsute with relatively large trichomes, 2-3 mm. long, about 1 mm. wide; petals white, spathulate with a slender claw, 3-4 mm. long, about 1.5 mm. wide; pedicels divaricately ascending, slender, pubescent, 5-12 mm. long; siliques erect, glabrous, nearly terete to slightly flattened parallel to septum, 2-4 mm. long, about 1 mm. wide; valves nerved from base to apex; styles about 0.5 mm. long; stigma unexpanded or only slightly expanded; seed oblong, about 1 mm. long, biseriate; cotyledons incumbent (Rollins 1943).

3. **LOCAL FIELD CHARACTERS:** The only members of the Mustard Family with which it might be confused are species of Arabis with upright siliques, though they have flattened fruits, and species of Sisymbrium, though they have dissected leaves.

   Misidentification of Arabis hirsuta for Halilmolobos virgata was made for a Sheridan County specimen. The latter has ascending siliques closely paralleling the stem as compared to diverging, with small petals of 2-3 mm as compared to >4 mm, and round siliques with biseriate seeds as compared to flattened siliques with uniseriate seeds (Fertig pers. commun.).

D. GEOGRAPHICAL DISTRIBUTION

1. **RANGE:** Halimolobos virgata is distributed mainly along foothills of the Rocky Mountains. Hitchcock and Cronquist (1973) characterize its distribution as extending from Alberta and Saskatchewan to Colorado and Utah, extending all the way north to the Yukon. However, Scoggan (1978) refers all material outside southern Alberta and southwestern Saskatchewan to Halimolobos mollis. The Halimolobos virgata is ranked critically imperiled (S1) in Alberta and Saskatchewan, and status unknown (SU) in Colorado. It is known from twenty collections spanning over half of Wyoming from a wide array of habitats, which provides basis for lowering its global rank to at least G3 (Fertig pers. commun.).

2. **CURRENT SITES:** In Montana, Halimolobos virgata is known from five sites in two counties. The first reported Montana collection was only recently made in 1986 from Sheridan County (Moers 1147 MONTU, RM). However, this specimen was misidentified and has been annotated to Arabis hirsuta by Walter Fertig, and deleted from the Biological Conservation Database. This revises distribution information presented on the species in Vanderhorst and Lesica (1994).

EO no.	Site location
001	Sweetgrass Hills, Liberty Co. northwest of Black Jack Butte above Sage Creek
002	Sweetgrass Hills, Liberty Co., southeast of Black Jack Butte above Dohrs Creek
003	Tendoy Mts., Beaverhead Co., Pileup Canyon
004	Tendoy Mts., Beaverhead Co., Limekiln Canyon
005	East Pioneer Mts., Beaverhead Co., East Fork of Blacktrail Deer Creek

3. **HISTORICAL SITES:** None

4. **UNVERIFIED/UNDOCUMENTED REPORTS:** Its presence at far north and south ends of the Rocky Mountains in the state would lead one to expect populations between the two.

5. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** This species was extensively sought throughout the Sweetgrass Hills with particular emphasis on dry foothills. It has low habitat fidelity or undefined habitat requirements, being absent from large areas that would seem to provide suitable habitat.

E. HABITAT

1. **ASSOCIATED VEGETATION:** Vegetation associated with this species in the Sweetgrass Hills represents Potentilla fruticosa - Festuca idahonis association with codominance or major cover contributions by Agropyron dasystachyum and Stipa comata. Other common species at the site include Oxytropis sericea, Agropyron spicatum, Cerastium arvense, Galium boreale, Potentilla fruticosa and Artemisia frigida.

Associated vegetation at both Sweetgrass Hills sites includes a conspicuous display of species which increase under grazing pressure, such as Oxytropis sericea and Cerastium arvense (Figure 5). Both Sweetgrass Hills sites, including the undisturbed site, are located along vehicle routes (Figure 6). This is suggestive that while Halimolobos virgata presence may be positively correlated with increaser species and with disturbance regimes, it is infrequent and inconsistently found under these conditions, signifying low habitat fidelity.

The Tendoy Mountains sites are in localized areas of woody steppe or scrub communities. Associated species in the Limekiln Canyon site are Artemisia tridentata, Agropyron spicatum, Chrysothamnus viscidiflorus and Arabis holboelii as well as disturbance species. Associated species in the Pileup Canyon site are Cercocarpus ledifolius, Artemisia tripartita, Festuca idahonis, Poa pratensis, Poa nevadensis, Juncus balticus, Iris missouriensis, and Antennaria microphylla. The site at the south end of the Pioneer Mountains has limited information on associated vegetation. Species associates mentioned on the collection label include Agropyron spicatum and Koeleria cristata.

Most of the Halimolobos virgata specimens collected in Wyoming and reviewed by Walter Fertig in the Rocky Mountain Herbarium have limited habitat data, but they seem to reflect a wide range of habitats, with habitat descriptions including "greasewood", "rolling sagebrush plains and rocky slopes", "rocky flats", "ravine below limber pine slopes", "limestone outcrops and grassy slopes", "dry, clayey soil", "roadside weed", "slightly alkaline flats" and "open slopes and ridges and badlands, sandstone and shales" (Fertig pers. commun.).

2. **TOPOGRAPHY:** Most Montana sites are on gentle topography in a foothills setting, but at least one site, in Pileup Canyon of Beaverhead County, is in a terrace bottom setting which is moist in the spring. The other Tendoy Mts. site in Limekiln Canyon is a droughty upper slope setting, though the plants are growing under partial shade. The Sweetgrass Hills population above Sage Creek is on an open sandstone bench above the valley (Figure 5).

Figure 5. Sage Creek habitat of Halimolobos virgata, looking northeast

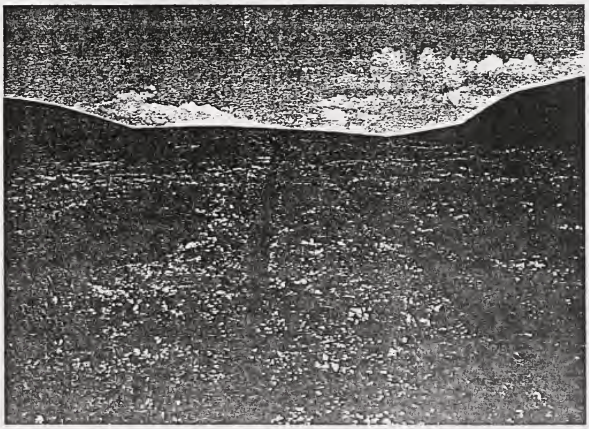


Figure 6. Margin of Halimolobos virgata habitat above Sage Creek valley (few plants found between tracks, extending to right; north)

3. **SOIL RELATIONSHIPS:** All of the Beaverhead County sites are on gravelly calcareous mollisols derived from Madison Group limestone. Even though the Sweetgrass Hills has limestone outcrops, both sites of the Halimolobos virgata are on sandy mollisols derived from the Eagle Sandstone Formation.

4. **REGIONAL CLIMATE:** The foothills settings occupied by Halimolobos virgata have climatic conditions most resembling those monitored nearby in Chester, MT. It is the climate of semi-arid steppe, including low precipitation, cold winter,s and hot summers.

F. POPULATION DEMOGRAPHY AND BIOLOGY

1. **PHENOLOGY:** Plant collection dates in Montana range from May 28 - July 13, but all five of the specimens were collected when primarily or totally in fruiting condition. It is extrapolated that flowering begins by early May, and may be prolonged into early summer by indeterminate growth and branching off the main stems under favorable conditions, with flowering and fruiting overlapping for at least a couple weeks. It is more conspicuous in flowering than fruiting condition. Fruits are needed for positive identification.

2. **POPULATION SIZE AND CONDITION:** The total number of plants in the state represented by known populations is between 500-1100 plants, based on population estimates at the five known sites.

EO no.	Population size
001	Sweetgrass Hills - Dohrs Creek; highly discontinuous along two-track road totalling 50-100 plants
002	Sweetgrass Hills - Sage Creek; one population center of 200-300 plants
003	Tendoy Mts. - Pileup Canyon; one population center of ca. 100 plants
004	Tendoy Mts. - Limekiln Canyon; one population center of 100-500 plants
005	East Pioneer Mts., uncommon in one population center

3. **REPRODUCTIVE BIOLOGY**

a. **TYPE OF REPRODUCTION:** Halimolobos virgata reproduces from seed only. Most biennials do not produce seed until their second year. In the Sweetgrass Hills, most Halimolobos virgata plants were the same height (ca. 2 dm), but stunted plants were also seen - it is possible that the less vigorous plants are ones which produced seed in their first year rather than just producing rosettes. Rosettes of Halimolobos virgata were not found in close inspection around flowering plants, but may have been overlooked.

b. **POLLINATION BIOLOGY:** Halimolobos virgata has weakly-developed nectar glands, adapted for insect pollination. No pollinator visits were observed. The most likely insect visitors in early spring are bees (Hymenoptera) and flies (Diptera).

c. **SEED DISPERSAL AND BIOLOGY:** The siliques dehisce along the length of valves on either side of the fruit. The small, lightweight seeds are not known to have any dispersal adaptation and might be expected to fall around the base of the parent plant.

G. **POPULATION ECOLOGY**

1. **BIOLOGICAL INTERACTIONS**

a. **COMPETITION:** The coarse, droughty soils overlying limestone or sandstone on which it grows may reflect poor competitiveness.

b. **HERBIVORY:** Many infloresences of Halimolobos virgata were grazed or browsed in the Sweetgrass Hills site northwest of Black Jack Butte, which was opened for early-season livestock grazing in 1993. Infloresences were eaten at the Sweetgrass Hills site southeast of Black Jack Butte in a pasture which had not been open to livestock grazing at the time of visit. They are apparently among the first palatable forbs to bolt in their habitat. These observations suggest that they are likely to be grazed by cattle early in the growing season. Grazed plants produced multi-branched infloresences which still flowered and set seed in the moist 1993 growing season.

H. **LAND OWNERSHIP** Three of the five known locations for this species are on lands administered by the BLM.

EO no.	Land ownership
001	Sweetgrass Hills - Dohrs Creek; BLM-Lewistown District on recently-acquired tract
002	Sweetgrass Hills - Sage Creek; private
003	Tendoy Mts. - Pileup Canyon; BLM-Butte District
004	Tendoy Mts. - Limekiln Canyon; BLM-Butte District
005	East Pioneer Mts.; Blacktail Game Management Area of Montana Fish, Wildlife and Parks Dept.

III. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. THREATS TO CURRENTLY KNOWN POPULATIONS:

1. **GRAZING:** Browsing by cattle reduced seed production on the Sweetgrass Hills BLM site in 1993 but occurred early enough in the season so that the browsed infloresences branched and produced new flowers and seeds (see discussion of browsing, preceding page). No plants were killed by browsing action. These observations must be qualified in noting that the Sweetgrass Hills BLM site is restricted to disturbed borders along an old two-track road, which would be expected to be have concentrated livestock use, and **maximize** the apparent affect of browsing. It should also be noted that 1993 was an exceptionally cool, wet season so that the prolonged, mild conditions may have **minimized** the effect of browsing. Grazing impact cannot be ascertained based on such limited information.

2. **MINING:** There is no mining activity on the Eagle Sandstone Formation underlying Sweetgrass Hills populations of Halimolobos virgata. There are currently no mining access developments and accompanying weed infestations that pose indirect impact to the species, but the potential exists.

3. **TIMBER HARVESTING:** None

4. **WEED CONTROL ACTIVITIES:** None at present

B. MANAGEMENT PRACTICES AND RESPONSE:

The road access provided through the BLM population in the Sweetgrass Hills above Dohrs Creek is gated shut and presumed restricted for use by the permittee. There is no botanical basis for recommending change to this level of use.

One of the Tendoy Mountains population sites on BLM land in Limekiln Canyon is noted as having livestock disturbance and invasion by weeds. There is not sufficient information upon which to base livestock management recommendations. The Tendoy Mts. site may serve for management response study in the future.

C. RECOMMENDATIONS FOR MAINTAINING VIABLE POPULATIONS:

Habitat requirements for this species are unknown; it may depend a narrow set of microhabitat conditions or natural disturbance conditions that are found in many otherwise varied habitat types. Until the habitat framework is better defined, it will not be possible to determine the need for and plan species' conservation.

D. **RECOMMENDATIONS FOR FURTHER ASSESSMENT:** Halimolobos virgata is an early-blooming plant that may be more common than is currently known. Populations are in partially disturbed habitat at two of the five sites in the state, and adventive at one of the Sweetgrass Hills sites. More investigation is needed to discern cause from effect in finding small populations of this species in disturbed sites. It is being kept at the state rank of critically imperiled (S1) based on it limited number of sites and small total numbers documented in the state. It is recommended that the Bureau of Land Management continue to collect information on it under "watch" status at least until the above questions are resolved, and consider the prospects for studying it at the Tendoy Mts. site where it occurs in degraded habitat.

E. **SUMMARY** Halimolobos virgata is a species which presents an intriguing picture with unusual distribution patterns in Montana and low fidelity to suitable local habitats. Based strictly on tally of known populations and their numbers, it may be critically imperiled in the state, and will be ranked accordingly until such time as new populations are found or dependency on unnatural disturbance is demonstrated.

Ranunculus cardiophyllus
Heart-leaved buttercup

A. CLASSIFICATION

1. SCIENTIFIC NAME: Ranunculus cardiophyllus

2. COMMON NAME: Heart-leaved buttercup

3. FAMILY: Ranunculaceae (Buttercup Family)

4. GENUS: Ranunculus (Buttercup)

5. SPECIES: R. cardiophyllus (Lat. heart-leaved, based on the outline of the basal leaf)

This taxon is considered to be poorly understood; it is similar to R. pedatifidus and R. inamoenus (Welsh et al. 1987). Scoggan (1978) considers it to be a variety of R. pedatifidus. The presence of R. cardiophyllus and R. pedatifidus as well as R. inamoenus in the Sweetgrass Hills is believed to represent the only area in the United States where these related taxa overlap in distribution.

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. FEDERAL STATUS

a. U.S. FISH AND WILDLIFE SERVICE: None

b. U.S. BUREAU OF LAND MANAGEMENT: Watch

c. U.S. FOREST SERVICE: None

2. STATE: Ranunculus cardiophyllus has a state rank of critically imperiled (S1) based on a total of seven records in three counties, most sites noted as having potential threats and having little or no protection. There are no known large populations among the seven records.

C. DESCRIPTION

1. GENERAL NONTECHNICAL DESCRIPTION: Terrestrial, upright herbaceous perennial with relatively conspicuous yellow flowers with shiny-looking petals, usually one per stem, occasionally more (Figure 7). The simple basal leaf has shallowly-lobed margins and a cordate base. It is necessary to consider technical achene and nectary scale features to make positive identification.

2. TECHNICAL DESCRIPTION: Perennial from fibrous roots, the stems erect, rather freely branched, not nodally rooting, 15-40 cm.

tall, fistulose, copiously pilose to occasionally glabrate; basal leaves with stout petioles 2-12 cm. long, the blades cordate, (1.5) 2-6 cm. long and nearly or quite as broad, deeply crenate to shallowly lobed and narrowly toothed, pilose, gradually transitional to the more-deeply lobed, shorter-petiolate, alternate cauline leaves and the sessile, deeply 5- to 7-parted bracts; pedicels (2) 5-14 cm. long; sepals 5, yellowish, spreading, 6-10 mm. long, pilose, quickly deciduous; petals 5, yellow, 8-15 mm. long; nectary scale about 1 mm. long, the lateral margins adnate the full length and forming a pocket, the upper free margin truncate, conspicuously ciliate; receptacle ovoid, up to 12 mm. long in fruit, hairy; stamens 35-75; achenes 20-100 in an oblong cluster, obovate in outline, 1.5-2 mm. long, somewhat compressed, about half as thick as broad, finely puberulent and often somewhat reticulate, inconspicuously margined, the stylar beak slender, 0.6-1 mm. long, nearly or quite straight (from Hitchcock et al. 1964). Verification of all Sweetgrass Hills specimens was provided by Ron Hartman.

3. **LOCAL FIELD CHARACTERS:** There are eight non-stoloniferous, upright species of buttercup that have been collected or observed in the Sweetgrass Hills (Appendix C). Five of them have basal leaves which are not compound, including Ranunculus pedatifidus, R. cardiophyllus, R. eschscholtzii, R. inamoenus and R. abortivus. Only the latter species of these four has inconspicuous petals shorter than 3.5 mm long and which are smaller than the sepals; the two rare species have conspicuous petals. The R. eschscholtzii is distinguished in being nearly glabrous, and is most readily confused with R. pedatifidus. The Ranunculus inamoenus is distinguished in having basal leaves which are rounded to cuneate at the base compared with R. cardiophyllus and R. pedatifidus, as well as having petals 0.2-0.8 mm. long with a long achene beak, as compared to R. abortivus with petals 0.2 or less long and a short beak. The basal leaf outline is very different between the two rare species, C. cardiophyllus basal leaves being entire with shallow lobes, and R. pedatifidus basal leaves being deeply lobed to the base (see figures 8, 11). Note that this is the only distinguishing characteristic between the two species easily discerned in the field. The basal leaf(ves) can be found on most plants through the time of flowering, but they wither by the middle of the growing season. The achene characteristics of the two species differ in that R. cardiophyllus has a finely puberulent achene with a straight beak, while R. pedatifidus has a glabrous achene with a curved beak. The technical characteristics described in Dorn (1984) which distinguish R. cardiophyllus from R. pedatifidus is the ciliate nectary scale of R. cardiophyllus as opposed to the glabrate nectary scale of R. cardiophyllus.

Figure 7. Ranunculus cardiophyllus close-up

Figure 8. Technical illustration of Ranunculus cardiophyllus

D. **GEOGRAPHICAL DISTRIBUTION**

1. **RANGE:** Ranunculus cardiophyllus occurs from British Columbia and the Northwest Territories to Alberta and Saskatchewan, southward sporadically along the Rocky Mountains to northeastern Washington, Montana, Wyoming, Utah and Arizona (Hitchcock et al. 1964). It is common in grasslands of the Cypress Hills (Brietung 1954), a large isolated plateau to the northeast.

2. **CURRENT SITES:** In Montana, Ranunculus cardiophyllus is known from seven sites in three counties:

EO no.	Location
001	Glacier Co., Browning
002	Toole Co., Sweetgrass Hills above Fred and George Creek
003	Sweetgrass Co., east side of Crazy Mts.
004	Glacier Co., Duck Lake
005	Glacier Co., Duck Lake ponds
006	Glacier Co., Goose Lake vicinity
007	Toole Co., Sweetgrass Hills; Spring Creek vicinity

3. **HISTORICAL SITES:** N/A

4. **UNVERIFIED/UNDOCUMENTED REPORTS:** None

5. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** Suitable Sweetgrass Hills habitat was not found along Deer, McDonald or Limekiln Creeks of West Butte in the segments surveyed. There appeared to be suitable, somewhat degraded habitat along a few wetlands associated with East Butte watercourses, e.g., the spring meadow at the head of Government Creek, but no plants were found.

E. **HABITAT**

1. **ASSOCIATED VEGETATION:** All Montana habitats for Ranunculus cardiophyllus are characterized as moist grasslands. Each of the records which characterize associated vegetation (five of seven) describe it as associated with the Potentilla fruticosa - Festuca scabrella habitat type, at the wet end of its gradient.

   Associated invasive or exotic plants include: Poa pratensis, Poa compressa, Phleum pratense and Symphoricarpos occidentalis, all of which are present among Sweetgrass Hills sites (Figure 9).

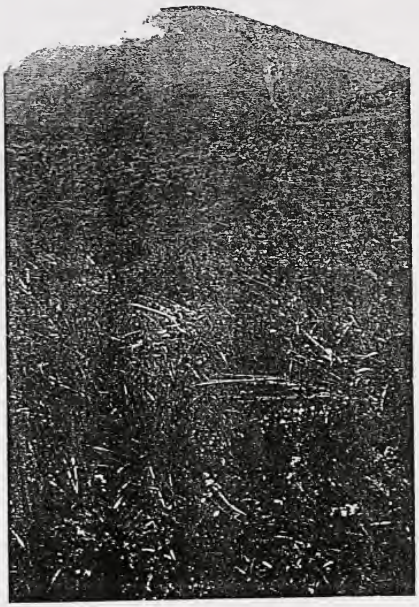


Figure 9. Ranunculus cardiophyllus growing in Potentilla fruticosa - Festuca scabrella h.t.; locally dominated by Phleum pratense

(Note: West Butte is in background, looking south)

Associated wetland plants include: Juncus balticus, Carex aurea, and Hierochloe odorata. Other associated species include: Galium boreale, Potentilla glandulosa, Festuca idahonis, Zigadenus elegans, Geranium viscossisimum, Perideridia gairdneri, Botrychium lunaria and Sisyrinchium montanum.

2. **TOPOGRAPHY:** Sweetgrass Hills sites are in headwater spurs and meadows above watercourses, near the base of West Butte (Figure 10). All other sites for it in Montana are similarly in foothills settings and associated with a wetland margin or watercourse. These settings have subsurface water flow, representing subirrigated range sites.

3. **SOIL RELATIONSHIPS:** The Sweetgrass Hills sites are situated right below the contact zone between Colorado shale and underlying Eagle Sandstone, apparently at local groundwater discharge areas. Soils are dark loamy mollisols that are ephemerally or temporarily saturated.

4. **REGIONAL CLIMATE:** The Sweetgrass Hills as isolated nunatak has a moderate climate compared to the semi-arid steppe climate of surrounding plains, with additional precipitation and relatively cool early-season growing season conditions.

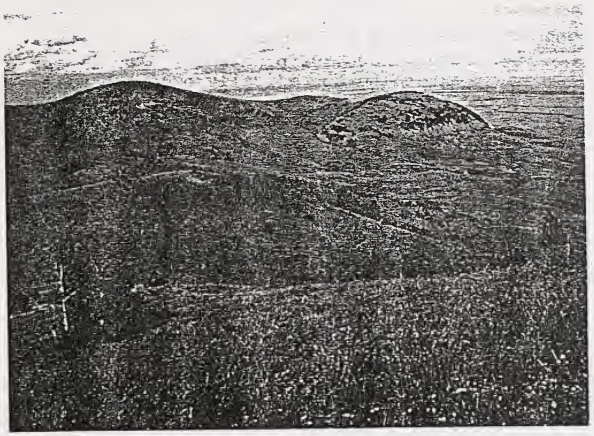


Figure 10. Ranunculus cardiophyllus habitat above Fred and George Creek; from the northern flanks of West Butte looking north. Note: This site corresponds with the one shown in previous photo.

F. POPULATION DEMOGRAPHY AND BIOLOGY

1. **PHENOLOGY:** Montana specimens have been collected between 30 May and 10 July, all material after mid- June being in fruit. It is suspected that flowering is initiated earlier than any existing collection dates, with flowering expected to begin in late May for the Sweetgrass Hills populations.

2. **POPULATION SIZE AND CONDITION:** Population size estimates range from 50-400, with the largest population being in the Sweetgrass Hills on Fred and George Creek. They are typically discrete and clustered in a single area, but the Fred and George Creek population is diffuse in its upland margin where it persists in very low numbers under invasion of bluegrass (Poa spp.) and encroachment of buckbrush (Symphoricarpos occidentalis), also found in very low numbers upstream for a half mile. It is possible that the two populations in the Sweetgrass Hills, though they are on different drainages, may be close enough for cross-pollination and technical consideration as a single population with subpopulations.

Population size of Ranunculus cardiophyllus in Montana

EO no.	Population size
001	Glacier Co., Browning; unknown
002	Toole Co., Sweetgrass Hills above Fred and George Creek; 300-400 plants centered in one area but extending sporadically over 0.5 miles
003	Sweetgrass Co., east side of Crazy Mts.; "scattered"
004	Glacier Co., Duck Lake; about 100 plants
005	Glacier Co., Duck Lake ponds; over 100 plants
006	Glacier Co., Goose Lake vicinity; 50-100+ plants
007	Toole Co., Sweetgrass Hills; Spring Creek vicinity; 30-90 plants

3. **REPRODUCTIVE BIOLOGY**

a. **TYPE OF REPRODUCTION:** Reproduction is sexual and flowers are monoecious. In light of genus adaptations for pollination (mentioned below), outcrossing is likely to be significant if not predominant. In cases of more than one flower per plant, the flowers reach anthesis at different times, which further promotes outcrossing.

b. **POLLINATION BIOLOGY:** The nectary glands in the Ranunculus genus are adaptations for attracting insect pollinators. The pollen vector is unknown but would be an insect that is active early in the season, such as flies (Diptera) or bees (Hymenoptera).

c. **SEED DISPERSAL AND BIOLOGY:** The seeds readily fall to the ground when they have matured, close to the parent plant. Stratification and treatment conditions required for germination are not known.

G. **POPULATION ECOLOGY**

1. **BIOLOGICAL INTERACTIONS**

a. **COMPETITION:** Ranunculus cardiophyllus persists among exotic grasses including Poa pratensis, Poa compressa, and Phleum pratense (Figure 9). The rhizomatous exotic grasses may be better competitors than the cespitose native species, Festuca scabrella, that otherwise dominates in suitable habitat. A major portion of the Fred and George Creek population is also crowded out by buckbrush (Symphoricarpos occidentalis).

b. **HERBIVORY:** The juice of Ranunculus species is characterized as acrid, and the species are generally unpalatable (Hitchcock et al. 1964). No signs of grazing or browsing were observed.

H. LAND OWNERSHIP

EO no.	Location
001	Glacier Co., Browning; unknown
002	Toole Co., above Fred and George Creek; private
003	Sweetgrass Co., east side of Crazy Mts.; private but entered into TNC registry
004	Glacier Co., Duck Lake; Blackfeet Indian Reservation
005	Glacier Co., Duck Lake ponds; Blackfeet Indian Reservation
006	Glacier Co., Goose Lake vicinity; Blackfeet Indian Reservation
007	Toole Co., Spring Creek vicinity; private

III. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. THREATS TO CURRENTLY KNOWN POPULATIONS:

1. **GRAZING:** The species was growing in pastures that appear to be grazed late in the season. Since the plant withers by mid July, the direct potential affect of grazing is marginal. However, the plant grows along watercourses that provide water and high-value forage. The indirect alteration of natural habitat by grazing is a serious potential impact, as promoting invasion by exotic species and native disturbance-tolerant species.

   The Fred and George Creek population is dissected along its upper margin by a fenceline. It appeared that the west side with the heavier grazing had more complete alteration of native habitat and virtual absence of the species.

2. **MINING:** There is no mining activity in proximity to known Ranunculus cardiophyllus sites in the Sweetgrass Hills. There are currently no mining access developments and accompanying weed infestations that pose indirect impact to the species, but the potential exists.

3. **TIMBER HARVESTING:** No potential impacts have been identified.

4. **WEED CONTROL ACTIVITIES:** Noxious weed are not present at the Sweetgrass Hills site for this species, nor noted at other sites.

However, Centaurea maculosa, Cirsium arvense, and Euphorbia esula are all in the Sweetgrass Hills and have the potential to take over mesic grassland habitat as occupied by Ranunculus cardiophyllus.

B. **MANAGEMENT PRACTICES AND RESPONSE:** There are no populations on BLM lands in the Sweetgrass Hills so as to make site-specific management recommendations. In general, management practices which deter or reverse exotic grass encroachment are likely to benefit this species. This complements initiatives to maintain and restore riparian habitats.

C. **RECOMMENDATIONS FOR MAINTAINING VIABLE POPULATIONS:** The potential for increasing the species' limited population sizes through such practices as mowing encroaching buckbrush or conducting small controlled burns in tamegrass potential habitat warrant evaluation at sites with discretionary management.

D. **RECOMMENDATIONS FOR FURTHER ASSESSMENT:** Further survey of the species is recommended in other parts of its range around Glacier and Sweetgrass Counties.

E. **SUMMARY:** Ranunculus cardiophyllus is highly localized in the Sweetgrass Hills in mesic Festuca scabrella habitat above water discharge zones along watercourses. It is found in two West Butte locations below BLM boundaries.

Ranunculus pedatifidus
Northern buttercup

A. CLASSIFICATION

1. **SCIENTIFIC NAME:** Ranunculus pedatifidus

2. **COMMON NAME:** Northern buttercup

3. **FAMILY:** Ranunculaceae (Buttercup Family)

4. **GENUS:** Ranunculus (Buttercup)

5. **SPECIES:** R. pedatifidus (Lat. pedat referring to foot; as in the birdsfoot-shaped outline of the basal leaves)

   It is interesting to note that R. cardiophyllus is considered to be a variety of R. pedatifidus by Scoggan (1978), as mentioned on preceding pages. The presence of R. cardiophyllus and R. pedatifidus in the Sweetgrass Hills is believed to represent the only area in the United States where distribution of these related taxa overlaps.

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. **FEDERAL STATUS**

a. **U.S. FISH AND WILDLIFE SERVICE:** None

b. **U.S. BUREAU OF LAND MANAGMENT:** None

c. **U.S. FOREST SERVICE:** None

2. **STATE:** Ranunculus pedatifidus is currently ranked critically imperiled in the state (S1) based on three records from three counties. One of the records is historic and unrelocatable; the Sweetgrass Hills site represents a small, vulnerable population.

C. DESCRIPTION

1. **GENERAL NONTECHNICAL DESCRIPTION:** Terrestrial, upright herbaceous perennial with relatively conspicuous yellow flowers with a shiny-looking petals, usually one per stem, occasionally more. The simple basal leaf(ves) has deeply-lobed margins tracing a palmate outline (Figure 11). It is necessary to consider technical achene and nectary scale features to make positive identification.

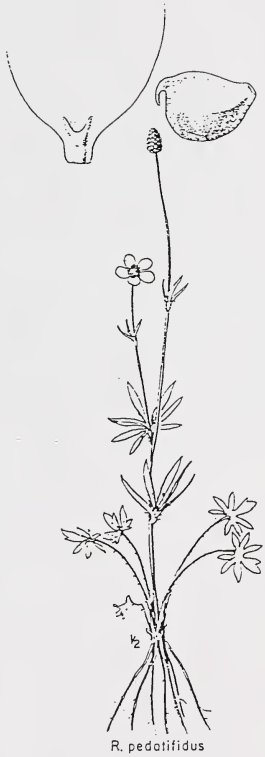


Figure 11. Technical illustration of Ranunculus pedatifidus

2. **TECHNICAL DESCRIPTION:** A sparsely to thickly pilose perennial with slender fibrous roots, the stems 1-several, erect, neither nodally rooting nor fistulose, 1-3 (4) dm. tall, mostly sparingly branched; basal leaves with a petiole 3-8 cm. long, the blade cordate, 1-3 cm. long, about as broad, pedately to irregularly parted into 5-7 lobed (simple) main segments, transitional to the upper stem leaves; cauline leaves alternate, becoming sessile above and divided into (3) 5-7 linear lobes as much as 25 mm. long; pedicels stout, up to 15 cm. long; sepals 5, spreading, 5-6 mm. long, pilose, soon deciduous; petals usually 5, yellow, more or less obovate, 8-10 mm. long; nectary scale glabrous, forming a small pocket at the base, the lateral margins adnate, spreading, extending higher than the free upper margin; receptacle ovoid-cylindrical, up to 8 mm. long in fruit, hairy; stamens mostly 25-50; achenes 25-80, in a cylindric-ovoid cluster, rotund-obovate in outline, somewhat compressed, nearly 2 mm. long, about half as thick as broad, distinctly margined but not keeled, finely puberulent to glabrate; stylar beak half as thick as broad, distinctly margined but not keeled, finely puberulent to glabrate; stylar beak half as thick as broad, distinctly margined but not keeled, finely puberulent to glabrate; stylar beak recurved, flattened, about 1 mm. long (from Hitchcock et al. 1964). Verification of all Sweetgrass Hills specimens was provided by Ron Hartman.

3. **LOCAL FIELD CHARACTERS:** The Sweetgrass Hills population of Ranunculus pedatifidus was initially taken to represent Ranunculus cardiophyllus because it was encountered in July after the diagnostic field characteristics were inconspicuous or absent. Many of the achenes had dropped and the basal leaves had withered. The following field characteristic text is modified from the previous text on Ranunculus cardiophyllus.

There are eight non-stoloniferous, upright species of buttercup that have been collected or observed in the Sweetgrass Hills (Appendix C). Five of them have basal leaves which are not compound, including Ranunculus pedatifidus, R. cardiophyllus, R. eschscholtzii, R. inamoenus and R. abortivus. Only the latter species of these five has inconspicuous petals shorter than 3.5 mm long and which are smaller than the sepals; the two rare species have conspicuous petals. The R. eschscholtzii is distinguished in being nearly glabrous, and is most readily confused with R. pedatifidus. The Ranunculus inamoenus is distinguished in having basal leaves which are rounded to cuneate at the base compared with R. cardiophyllus and R. pedatifidus, as well as having petals 0.2-0.8 mm. long with a long achene beak, as compared to R. abortivus that has petals 0.2 or less long and a short beak. The basal leaf outline is very different between the two rare species, R. pedatifidus basal leaves being deeply lobed to the base while R. cardiophyllus basal leaves being entire with shallow lobes. Note: this is the only distinguishing characteristic between the two species easily discerned in the field. The basal leaf(ves) can be found on most plants through the time of flowering, but withers by the middle of the growing

season. The achene characteristics of the two species differ in that R. cardiophyllus has a finely puberulent achene with a straight beak, while R. pedatifidus has a glabrous achene with a curved beak. The technical characteristics described in Dorn (1984) which distinguish R. cardiophyllus from R. pedatifidus is the glabrate nectary scale of R. cardiophyllus as opposed to the ciliate nectary scale of R. cardiophyllus.

D. GEOGRAPHICAL DISTRIBUTION

1. **RANGE:** Ranunculus pedatifidus is a circumpolar species that extends across much of Canada south to the 55th parallel, with disjunct occurrence in the Cypress Hills (Scoggan 1978). It is in Wyoming and Colorado of the Rocky Mountains; and is very sporadic in Montana, New Mexico and Arizona (Hitchcock et al. 1964).

2. **CURRENT SITES:** In Montana, Ranunculus pedatifidus is known from three sites in three counties:

EO no.	Location
001	Flathead Co., Columbia Falls
002	Glacier Co., Glacier National Park
003	Toole Co., Sweetgrass Hills, West Butte

3. **HISTORICAL SITES:** The Flathead County record from the Columbia Falls vicinity is based on an 1894 collection which cannot be relocated with precision and is likely to have been extirpated.

4. **UNVERIFIED/UNDOCUMENTED REPORTS:** A Ranunculus specimen collected by Klaus Lackschewitz from Deerlodge National Forest in the Anaconda-Pintlar Range (Granite Co.) in 1993 is pending review which may represent Ranunculus pedatifidus (Lackschewitz pers. commun.). If this is the case, it represents a major range extension.

5. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** Perched marsh habitat occupied by Ranunculus pedatifidus is very similar to that of R. cardiophyllus in the Sweetgrass Hills except that the setting for R. pedatifidus had no association with a watercourse. In effect, the surveys that were conducted for R. cardiophyllus rule out R. pedatifidus in these watercourse settings. There were no other similar marsh swale settings found on either East or West Buttes.

E. HABITAT

1. **ASSOCIATED VEGETATION:** Nonnative grasses seeded in for hay have taken over the tiny wetland basin occupied by Ranunculus

pedatifidus in the Sweetgrass Hills. The dominant exotics include: Bromus inermis, Agropyron repens and Phleum pratense. Only the eastern fringe of the wetland has a native community and is the part occupied by Ranunculus pedatifidus plants. The localized native dominant appears to be Deschampsia cespitosa. Associated species include: Castilleja cusickii, Potentilla gracilis and Vicia americana.

Vegetation is not described on either of the other two records for the species in the state, but it to be expected to contrast sharply with at least the Glacier National Park site where it grows on matted fellfield vegetation above treeline.

2. **TOPOGRAPHY:** The Glacier National Park site is on the summit of East Flattop Mountain in a fellfield, while the Sweetgrass Hills site is in a small perched wetland on a terrace just above the base of West Butte. These two sites contrast markedly in topographic position.

3. **SOIL RELATIONSHIPS:** Soils are temporarily saturated mollisols with a sandy loam texture. Like the preceding species, this one is also near the contact between Colorado Shale Formation and the Eagle Formation.

4. **REGIONAL CLIMATE:** The Sweetgrass Hills as isolated nunatak has a moderate climate compared to the semi-arid steppe climate of surrounding plains, with additional precipitation and relatively cool early-season growing season conditions.

F. POPULATION DEMOGRAPHY AND BIOLOGY

1. **PHENOLOGY:** The three Montana collection dates for this species range from 2 June to 12 July. The two earliest collections dates represent material in flower, including a 1 July collection made at (8000 ft.) elevation. The Sweetgrass Hill specimen of 12 July was collected in fruit. This population probably flowers by early or mid June.

2. **POPULATION SIZE AND CONDITION:**

EO no.	Population size
001	Flathead Co., Columbia Falls; unknown
002	Glacier Co., Glacier National Park; "uncommon"
003	Toole Co., Sweetgrass Hills; 43 individual plants

3. **REPRODUCTIVE BIOLOGY**

a. **TYPE OF REPRODUCTION:** Reproduction is sexual and flowers are monoecious. In light of genus adaptations for pollination (mentioned below), outcrossing is likely to be significant if not

predominant. In cases of more than one flower per plant, the flowers reach anthesis at different times, which further promotes outcrossing.

b. **POLLINATION BIOLOGY:** The nectary glands in the Ranunculus genus are adaptations for attracting insect pollinators. The pollen vector is unknown but would be an insect that is active early in the season, such as flies (Diptera) or bees (Hymenoptera).

c. **SEED DISPERSAL AND BIOLOGY:** The seeds readily fall to the ground when they have matured, close to the parent plant. Stratification and treatment conditions required for germination are not known.

G. POPULATION ECOLOGY

1. BIOLOGICAL INTERACTIONS

a. **COMPETITION:** Ranunculus pedatifidus has been competitively displaced in its Sweetgrass Hills wetland site by tall tamegrasses that appear to have been seeded, including Bromus inermis, Agropyron repens and Phleum pratense. It is restricted to a segment of wetland margin where native bunchgrasses still dominate, including Deschampsia cespitosa and Festuca scabrella.

b. **HERBIVORY:** The juice of Ranunculus species is characterized as acrid, and the species are generally unpalatable (Hitchcock et al. 1964). No signs of grazing or browsing were observed.

H. LAND OWNERSHIP

EO no.	Location
001	Flathead Co., Columbia Falls; unknown
002	Glacier Co.; Glacier National Park
003	Toole Co., Sweetgrass Hills; Bureau of Land Management

III. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. THREATS TO CURRENTLY KNOWN POPULATIONS

1. **GRAZING:** It appears that the Sweetgrass Hills site is in a pasture that is not grazed until after Ranunculus pedatifidus has finished flowering and maturing its fruits. While there may be no direct grazing impacts on the species, the seeding of tamegrasses for livestock forage across most of the tiny wetland basin representing its potential habitat may have reduced its numbers locally.

2. **MINING:** There is no mining activity in proximity to the one known Ranunculus pedatifidus sites in the Sweetgrass Hills.

There are currently no mining access developments and accompanying weed infestations that pose indirect impact to the species, but the potential exists.

3. **TIMBER HARVESTING:** No potential impacts were identified.

4. **WEED CONTROL ACTIVITIES:** Noxious weed are not present at the Sweetgrass Hills site for this species. However, Centaurea maculosa, Cirsium arvense, and Euphorbia esula are all in the Sweetgrass Hills and have the potential to take over meadow habitat as occupied by Ranunculus pedatifidus.

B. **MANAGEMENT PRACTICES AND RESPONSE:** Any activity which would destabilize the slopes above the population on BLM land would directly impact it. There are no known management activities affecting it at this time.

C. **RECOMMENDATIONS FOR MAINTAINING VIABLE POPULATIONS:** Population numbers appear low at the two relocatable sites for the species in Montana, and viability may be at stake for at least the Sweetgrass Hills population. Wetland restoration work at the Sweetgrass Hills site may be appropriate to consider if there are no other populations found after survey elsewhere in its range.

D. **RECOMMENDATIONS FOR FURTHER ASSESSMENT:** It is not practical to pursue further survey in the Sweetgrass Hills without high-resolution aerial photographs, which are not currently available. Any other suitable wetland habitat is highly localized if it exists at all, and may fall partially or entirely outside of public land boundaries.

Floristic surveys are being conducted in Glacier National Park, and Ranunculus pedatifidus will be recommended as a deliberate survey target by way of this report.

The Sweetgrass Hills population of 43 plants may be the largest in Montana. It is also the only one overlapping in distribution with R. cardiophyllus, a closely-related taxa. These species occur within a mile of one another. If their flowering times overlap, then closer investigation looking for intermediary features may be warranted, followed by genetic research as appropriate.

V. DISCUSSION

Origin of the Sweetgrass Hills flora is relictual in some sense, as suggested in persistence of two rare montane species, Claytonia lanceolata var. flava and Ranunculus pedatifidus. They are at their lowest state elevations in the Sweetgrass Hills. All four target species as found in the Sweetgrass Hills are highly disjunct in the region; Halimolobos virgata and Ranunculus cardiophyllus are also found in the even more isolated montane setting of the Cypress Hills ca. 100 miles (140 km) farther east in Canada (Brietung 1954).

The montane flora as a whole occupies suitable habitat in conditions which are sometimes appreciably different compared to species' habitat elsewhere in Montana and the range at large. This is particularly true of Ranunculus pedatifidus, which has a completely different topographic and hydrologic settings; low and wet in the Sweetgrass Hills compared to high and dry in the Rocky Mountains, and of Claytonia lanceolata var. flava, which appears to have a broader ecological amplitude in the Sweetgrass Hills than any other area of the state. While Sweetgrass Hills vegetation structure may be limiting for birds, as reflected by relatively low numbers of montane bird species (Thompson 1978), the montane flora of the area is not as tied to habitat structure as avifauna. The origin of the Sweetgrass Hills flora warrants palynological study before floristic composition and biodiversity can be interpreted in biogeographic research. The montane flora in general is incompletely documented for purposes of comparing its diversity with other outlying settings or segments of the Rocky Mountain chain.

Extended sensitive species survey on Sweetgrass Hills public lands beyond those of BLM may lead to additional information and provide a more complete sensitive species picture across the landscape.

Additional surveys may also reveal additional sensitive species, as judging by information that was compiled after the field season. It was determined from reviewing the Breitung Cypress Hills flora (1954) that there are 13 plant species of interest in the Cypress Hills not presently known from the Sweetgrass Hills. These 13 are tracked as state species of concern in Montana and are recommended for consideration in any future botanical work in the Sweetgrass Hills area, particularly in woodland and wetland habitats. They include: Lycopodium obscurum, Lilaea scilloides, Sphenopholis obtusata, Carex eburnea, Scirpus nevadensis, Cypripedium passerinum, Orchis rotundifolia, Salix serissima, Mirabilis hirsuta, Potentilla plattensis, Boisduvalia glabella, Viola renifolia, and Aster ptarmicoides.

Information obtained through this study supports the case for extending floristic analysis and initiating vegetation analysis as baseline.

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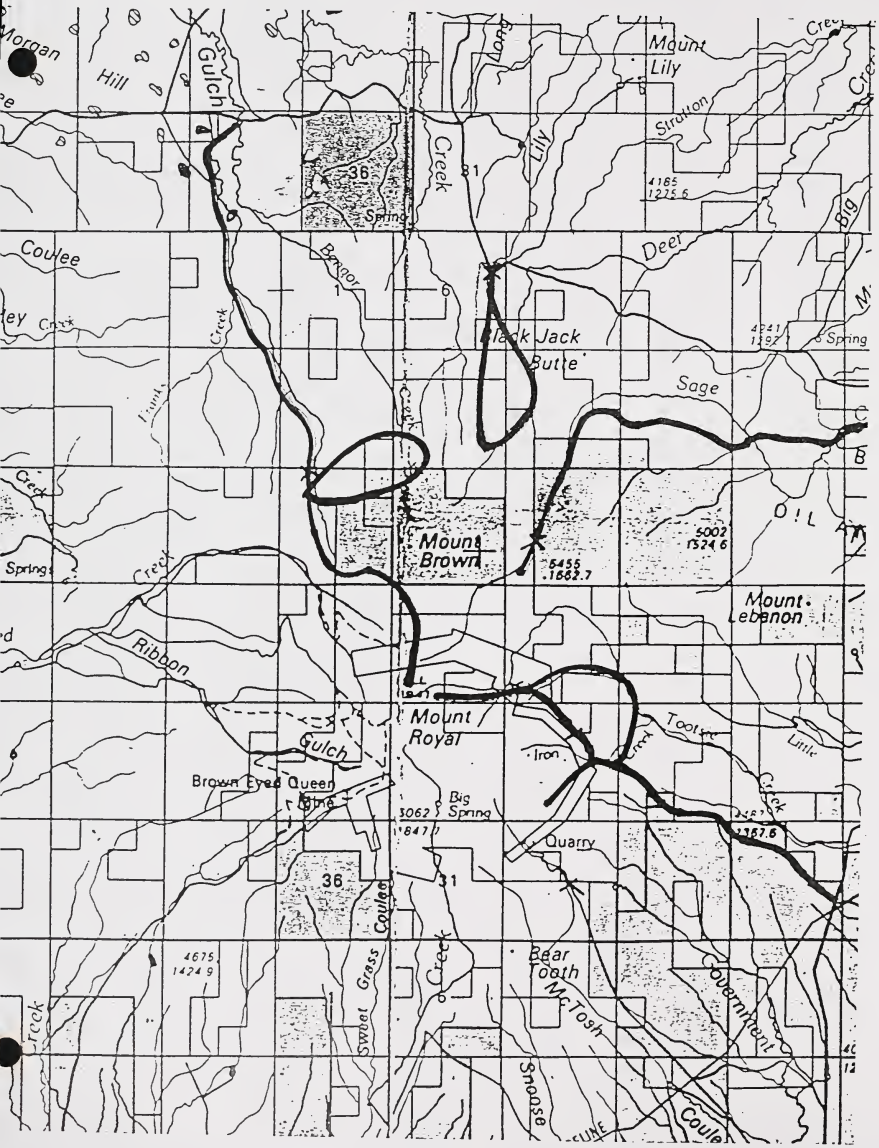
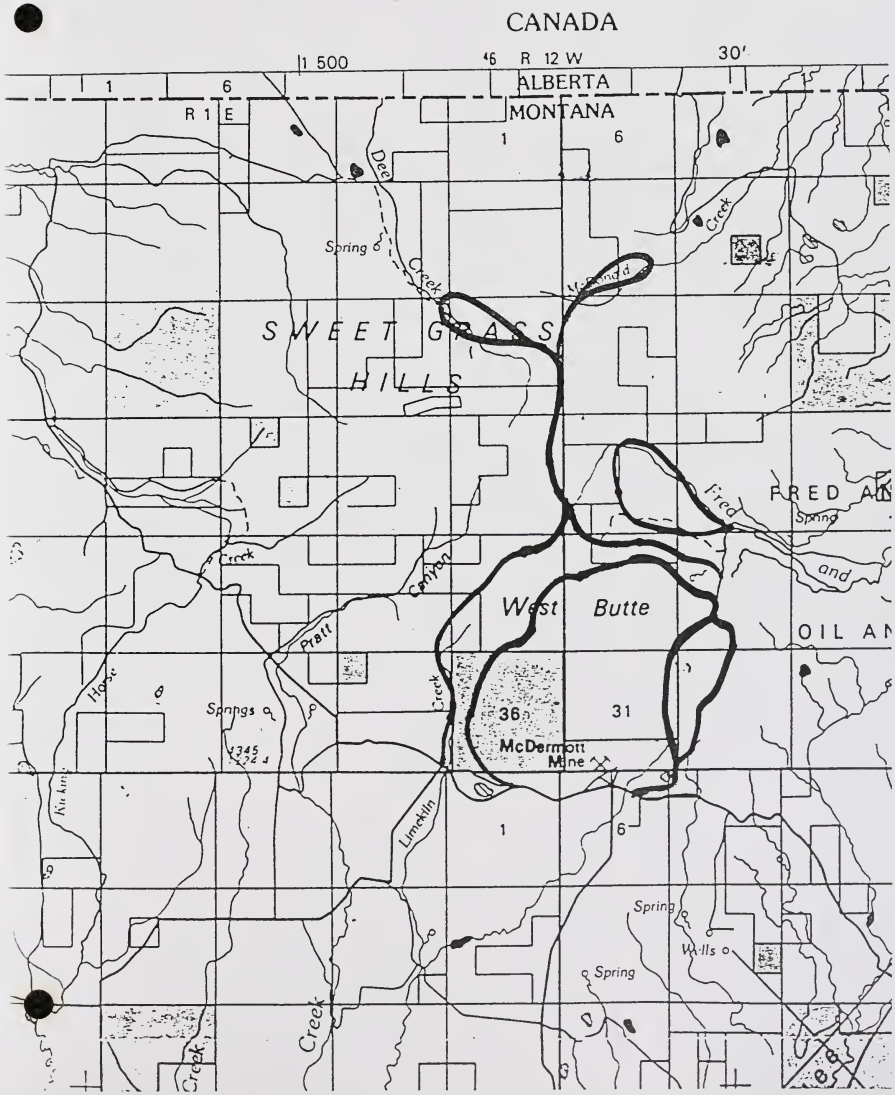
Appendix 1. Survey routes in the Sweetgrass Hills

East Butte survey routes



West Butte survey routes



Appendix 2. Element Occurrence Printouts and Maps

April 4, 1994

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: HALIMOLOBOS VIRGATA
Common Name: TWIGGY HALIMOLOBOS

Global rank: G2G3 Forest Service status:
State rank: S2 Federal Status: 3C
Element occurrence code: PDBRA1A040.001

Survey site name: SWEETGRASS HILLS EO rank: CD
EO rank comments: POPULATION SEEMS TO BE AN ACCIDENTAL INTRODUCTION ALONG AN OLD ROADBED.
County: LIBERTY
USGS quadrangle: HAWLEY HILL, BINGHAM LAKE

Township:	Range:	Section:	TRS comments:
036N	005E	06	W2SE4; 7 NE4NE4

Precision: S
Survey date: 1993-05-29 Elevation: 4620 - 4830
First observation: 1989-06-13 Slope/aspect: 2-15% / N-NW
Last observation: 1993-05-29 Size (acres): 0

Location:
SWEETGRASS HILLS, EAST BUTTE AREA, CA. 2 MILES NORTHEAST OF MOUNT BROWN, BORDERS OF UNIMPROVED TWO-TRACK ROAD CA. 0.5-0.75 MILE SOUTH OF GATE.

Element occurrence data:
1993: 50-100 PLANTS; BOTH FIRST AND SECOND YEAR PLANTS BELIEVED TO BE IN FLOWER. IN FRUIT AND VERY LATE FLOWERING ON 29 MAY. WIDELY SCATTERED IN SMALL GROUPS ALONG 0.25 MILE OF TWO-TRACK ROAD; A SMALL NUMBER OF PLANTS HAVE BEEN GRAZED, AND RESPROUTED WITH MANY BRANCHES. IN 1989: SPARSE POPULATION.

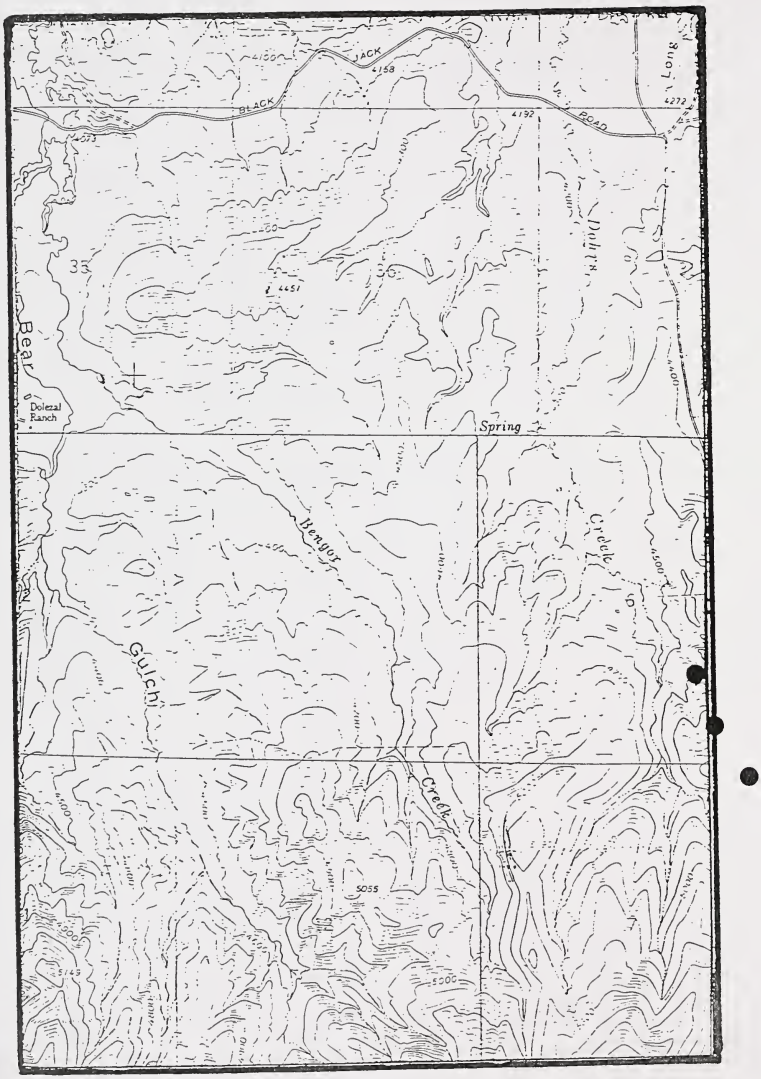
General site description:
ROADSIDE SETTING REPRESENTING DRY MICROHABITAT IN FOOTHILLS GRASSLAND DOMINATED BY FESTUCA IDAHOENSIS, AGROPYRON DASYSTACHYUM, AND STIPA COMATA ON THIN SOIL IN GLACIAL GRAVELS ON RIDGE CREST. ASSOCIATED SPECIES: POTENTILLA FRUTICOSA, AGROPYRON SPICATUM, OXYTROPIS SERICEA, CERASTIUM ARVENSE, GALIUM BOREALE, ARTEMISIA FRIGIDA.

Land owner/manager:
BLM: LEWISTOWN DISTRICT, GREAT FALLS RESOURCE AREA

Comments:
LONG HISTORY OF GRAZING AT MODERATE LEVELS AT SITE. AREA RECENTLY ACQUIRED BY BLM. RECORD PROVIDES BASIS FOR QUESTIONING WHETHER SPECIES IS ADVENTIVE IN ALL OR PARTS OF ITS MONTANA RANGE. BARE SOIL HABITAT AWAY FROM THE ROADBED IS NOT OCCUPIED BY THIS SPECIES.

Information source: HEIDEL, B. L. 1993. [MTNHP SENSITIVE PLANT SURVEYS IN THE SWEETGRASS HILLS CONDUCTED FOR THE BUREAU OF LAND MANAGEMENT.]

Specimens: DERFLER, E. C. (S.N.). 1989. GH.
HEIDEL, B. L. (1001). 1993. MONTU.



Halimolobos virgata .001
Hawley Hill 7.5 Quad

April 4, 1994

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: HALIMOLOBOS VIRGATA
Common Name: TWIGGY HALIMOLOBOS

Global rank: G2G3 Forest Service status:
State rank: S2 Federal Status: 3C

Element occurrence code: PDBRA1A040.002
Element occurrence type:

Survey site name: SWEETGRASS HILLS
EO rank: BC
EO rank comments: FAIR POPULATION SIZE AND HABITAT CONDITION.

County: LIBERTY

USGS quadrangle: BINGHAM LAKE

Township:	Range:	Section:	TRS comments:
036N	005E	08	SE4NE4

Precision: S
Survey date: 1993-05-30 Elevation: 4740 -
First observation: 1993-05-30 Slope/aspect: 2-5% / EAST
Last observation: 1993-05-30 Size (acres): 5

Location:
SWEETGRASS HILLS, EAST BUTTE AREA, ABOVE SAGE CREEK ON SANDSTONE BENCH SKIRTED BY ROAD; ACROSS FROM BLACK JACK BUTTE.

Element occurrence data:
200-300 PLANTS.

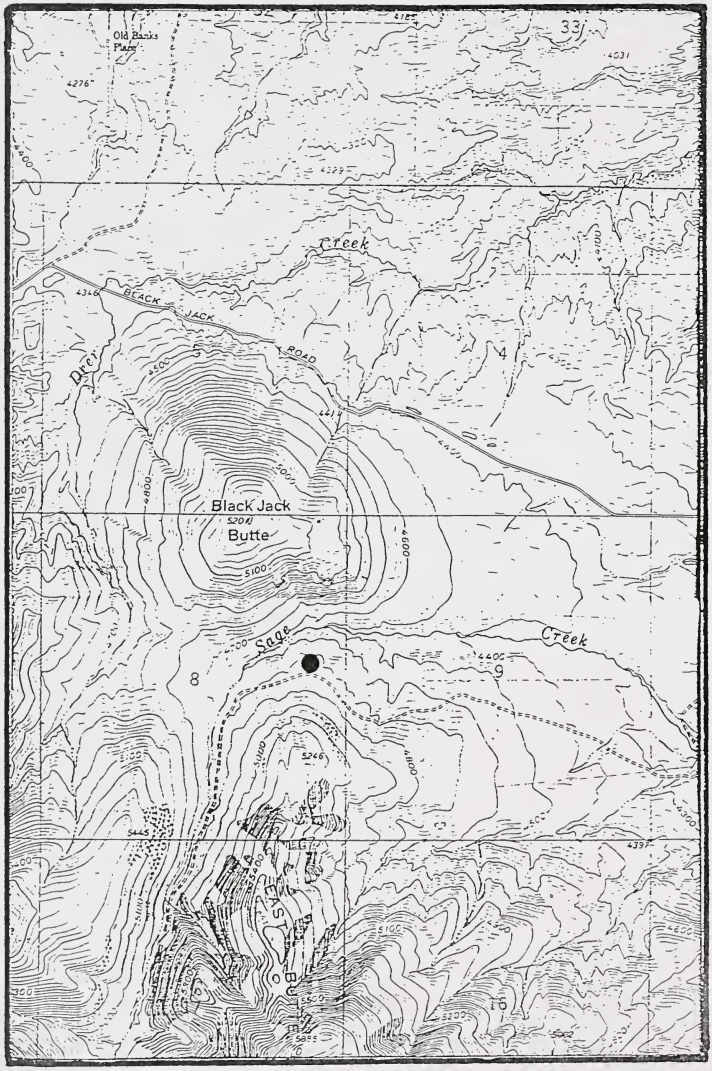
General site description:
FOOTHILLS GRASSLAND ON SANDSTONE BENCH DOMINATED BY DRY PHASE OF POTENTILLA FRUTICOSA/FESTUCA IDAHOENSIS - AGROPYRON DASYSTACHYUM. LONG GRAZING HISTORY AT MODERATE LEVELS. ASSOCIATED SPECIES: OXYTROPIS SERICEA, CERASTIUM ARVENSE, ARTEMISIA FRIGIDA, LESQUERELLA ALPINA, POA CUSICKII.

Land owner/manager:
PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:
THE SPECIES MAY BE ACTING AS AN INCREASER UNDER LIVESTOCK GRAZING AT THIS SITE, BUT IS NOT ADVENTIVE (SEE OCCURRENCE RECORD #001).

Information source: HEIDEL, B. L. 1993. [MTNHP SENSITIVE PLANT SURVEYS IN THE SWEETGRASS HILLS CONDUCTED FOR THE BUREAU OF LAND MANAGEMENT.]

Specimens: HEIDEL, B. L. (1010). 1993. MONTU, MONT.



Halimolobos virgata .002
Bingham Lake 7.5' Quad

March 30, 1994

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: RANUNCULUS CARDIOPHYLLUS
Common Name: HEART-LEAVED BUTTERCUP

Global rank: G4 Forest Service status:
State rank: S1 Federal Status:

Element occurrence code: PDRANOLOK0.007
Element occurrence type:

Survey site name: SWEETGRASS HILLS
EO rank: C
EO rank comments:

County: TOOLE

USGS quadrangle: WEST BUTTE

Township:	Range:	Section:	TRS comments:
037N	002E	30	NE4NE4

Precision: S
Survey date: 1993-06-10 Elevation: 4580 -
First observation: 1993-06-10 Slope/aspect: 0-5% / S-SW
Last observation: 1993-06-10 Size (acres): 1

Location:
SWEETGRASS HILLS, WEST BUTTE AREA, NORTH OF SPRING CREEK.

Element occurrence data:
30-90 PLANTS, IN FRUIT AND LATE FLOWERING. PLANTS ARE VIGOROUS AND MANY-FLOWERED.

General site description:
WETLAND WITHOUT SURFACE WATER ALONG A SMALL VALLEY SIDEARM ABOVE SPRING CREEK. VEGETATION REPRESENTS THE MOIST PHASE OF POTENTILLA FRUTICOSA/FESTUCA SCABRELLA HT. ASSOCIATED SPECIES: PHLEUM PRATENSE, PERIDERIDIA GAIRDNERI, SISYCHINCHIUM MONTANUM, POA PRATENSIS, BOTRYCHIUM LUNARIA, CAREX AUREA.

Land owner/manager:
PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:
ALL MONTANA RECORDS FOR THIS SPECIES OUTSIDE OF THE SWEETGRASS HILLS ARE ALPINE. AT THIS SITE, PHLEUM ALPINA GROWS IN A SLIGHTLY WETTER ZONE NEARBY. THIS POPULATION IS LESS THAN ONE MILE FROM OCCURRENCE #007; HOWEVER, THEY ARE IN DIFFERENT DRAINAGES.

Information source: HEIDEL, B. L. 1993. [MTNHP SENSITIVE PLANT SURVEYS IN THE SWEETGRASS HILLS CONDUCTED FOR THE BUREAU OF LAND MANAGEMENT.]

Specimens: HEIDEL, B. L. (1055). 1993. MONT. !HARTMAN.

March 30, 1994

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: RANUNCULUS CARDIOPHYLLUS
Common Name: HEART-LEAVED BUTTERCUP

Global rank: G4 Forest Service status:
State rank: S1 Federal Status:

Element occurrence code: PDRAN0L0K0.002
Element occurrence type:

Survey site name: SWEETGRASS HILLS
EO rank: BC
EO rank comments:

County: TOOLE

USGS quadrangle: WEST BUTTE

Township:	Range:	Section:	TRS comments:
037N	002E	20	SW4NW4; 19 SE4NE4, NW4SE4

Precision: S
Survey date: 1993-05-30 Elevation: 4605 - 4740
First observation: 1975-06-30 Slope/aspect: 0-5% / SW-SE
Last observation: 1993-05-30 Size (acres): 10

Location:
SWEETGRASS HILLS, WEST BUTTE, ABOVE FRED AND GEORGE CREEK ON NORTH SIDE.

Element occurrence data:
300-400 PLANTS, ALL IN FLOWER. MAIN SUBPOPULATION IS IN SECTION 20 AROUND AND ABOVE A SMALL WETLAND, EXTENDING WEST FOR 0.12 MILE. A FEW PLANTS WERE ALSO FOUND ON A TRIBUTARY STREAM IMMEDIATELY ABOVE ITS MOUTH. PLANTS ARE MOST VIGOROUS AND MANY-FLOWERED IN HABITAT WITHOUT BRUSH.

General site description:
WETLAND MARGIN AND ADJOINING MEADOW SLOPES IN A LOCALIZED FOOTHILLS SETTING. VEGETATION REPRESENTS THE MOIST PHASE OF POTENTILLA FRUTICOSA/FESTUCA SCABRELLA HT, WITH ABUNDANT POA COMPRESSA AND HEAVY INVASION OF SYMPHORICARPOS OCCIDENTALIS IN SECTION 19. ASSOCIATED SPECIES: GALIUM BOREALE, PHLEUM PRATENSE, POTENTILLA GLANDULOSA, JUNCUS BALTICUS, CAREX SPRENGELLII, GERANIUM VISCOSSISIMUS, HIEROCHLOE ODORATA.

Land owner/manager:
PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

March 30, 1994

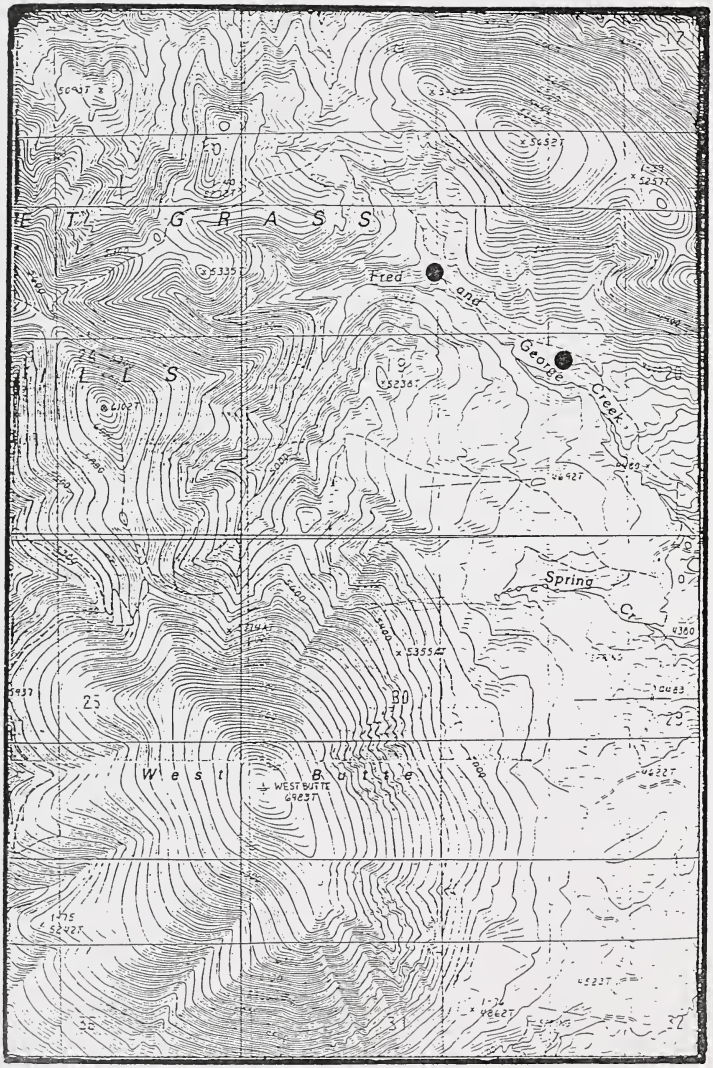
MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: RANUNCULUS CARDIOPHYLLUS (cont.)

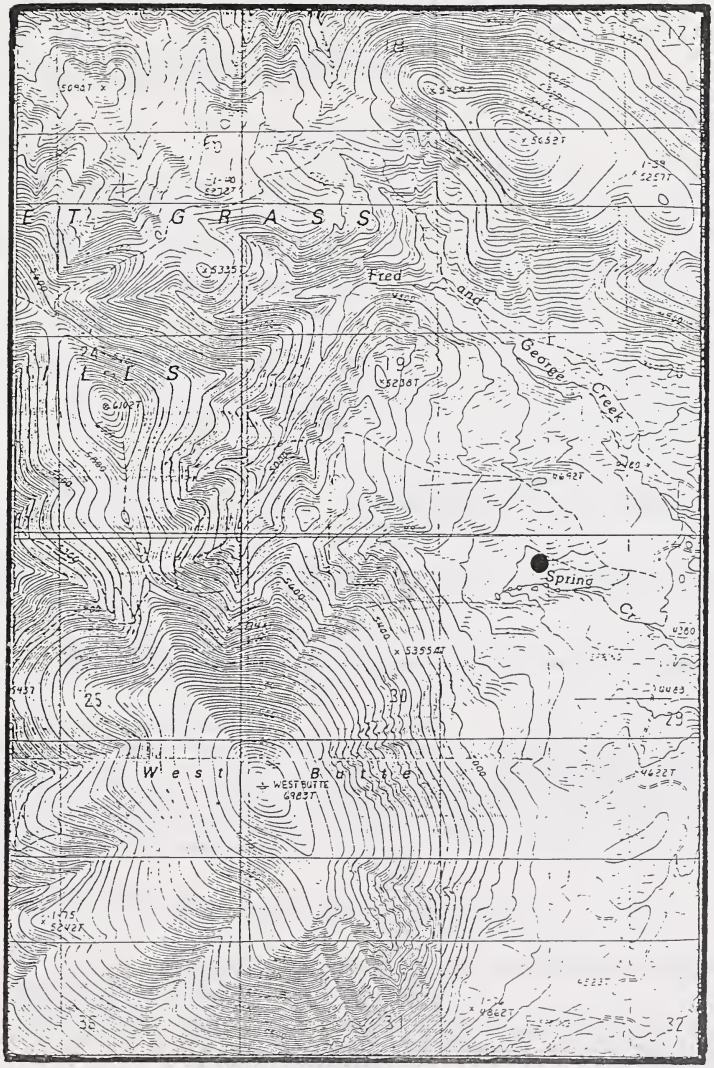
Comments:
THE LOCALIZED DOMINANCE OF PHLEUM PRATENSE INDICATES THAT THIS MAY HAVE BEEN AN AREA FOR STAKING HORSES.

Information source: HEIDEL, B. L. 1993. [MTNHP SENSITIVE PLANT SURVEYS IN THE SWEETGRASS HILLS CONDUCTED FOR THE BUREAU OF LAND MANAGEMENT.]

Specimens: MILLER AND HASSINGER (4828). 1975. LEA.
HEIDEL, B. (1021). 1993. MONTU, RM. !HARTMAN.



Ranunculus cardiophyllus .002
West Butte 7.5' Quad



Ranunculus cardiophyllus .007
West Butte 7.5' Quad

March 30, 1994

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: RANUNCULUS PEDATIFIDUS
Common Name: NORTHERN BUTTERCUP

Global rank: G5 Forest Service status:
State rank: S1 Federal Status:

Element occurrence code: PDRAN0L220.003
Element occurrence type:

Survey site name: SWEETGRASS HILLS
EO rank: C
EO rank comments: SMALL POPULATION.

County: LIBERTY

USGS quadrangle: WEST BUTTE

Township:	Range:	Section:	TRS comments:
037N	002E	29	SW4SW4

Precision: S
Survey date: 1993-07-12 Elevation: 4705 -
First observation: 1993-07-12 Slope/aspect: 0-1% / EAST
Last observation: 1993-07-12 Size (acres): 1

Location:
SWEETGRASS HILLS, WEST BUTTE AREA, ON LOWER SLOPE BENCH 1.5 MILES NNE OF MCDERMOTT RANCH.

Element occurrence data:
43 PLANTS AT NORTHEAST END OF WETLAND. IN LATE FRUIT WITH MANY SEEDS SHED.

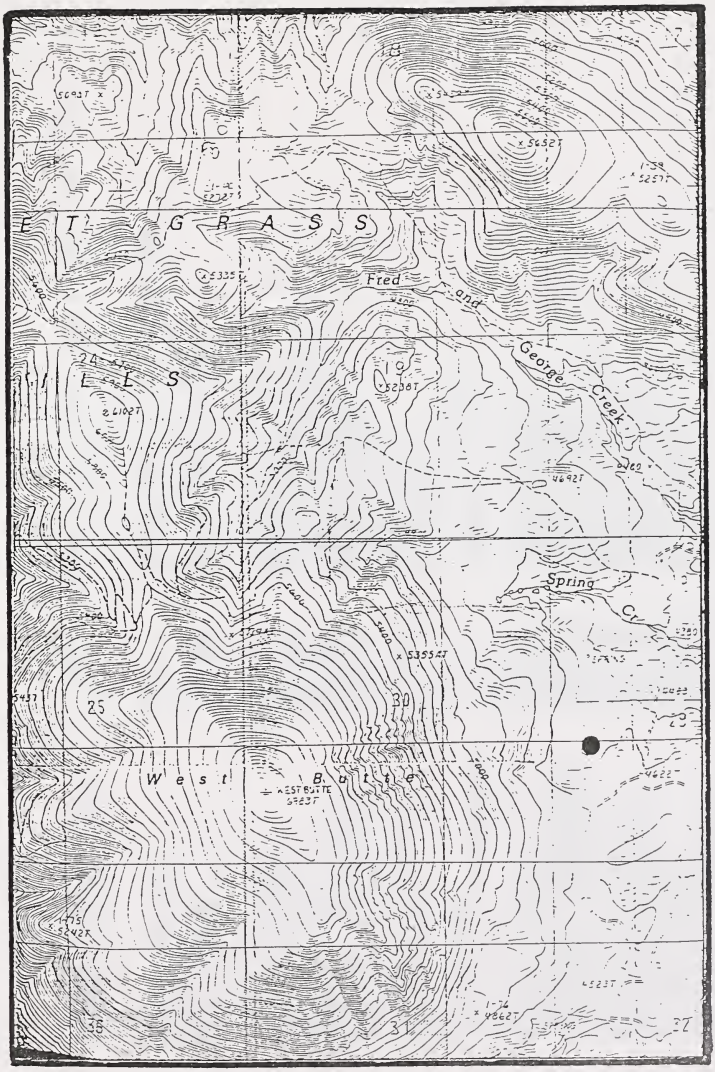
General site description:
PERCHED WETLAND ON BENCH BELOW WEST BUTTE. THE WET MEADOW VEGETATION IS DOMINATED BY NON-NATIVE GRASSES; MAINLY BROMUS INERMIS AND AGROPYRON REPENS. PLANTS ARE RESTRICTED TO SMALL ZONE HAVING LOWEST PRESENCE OF EXOTIC SPECIES. ASSOCIATED SPECIES: DESCHAMPSIA CESPITOSA, POTENTILLA GRACILIS, JUNCUS BALTICUS, PHLEUM PRATENSE, CASTILLEJA CUSICKII, VICIA AMERICANA.

Land owner/manager:
PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:
POPULATION IS COMPLETELY ON PRIVATE LAND, BUT THE WETLAND BASIN IN WHICH IT OCCURS EXTENDS ONTO BLM LAND.

Information source: HEIDEL, B. L. 1993. [MTNHP SENSITIVE PLANT SURVEYS IN THE SWEETGRASS HILLS CONDUCTED FOR THE BUREAU OF LAND MANAGEMENT.]

Specimens: HEIDEL, B. (1129). 1993. MONTU, RM. !HARTMAN



Ranunculus pedatifidus .003
West Butte 7.5' Quad

APPENDIX C. Preliminary flora of the Sweet Grass Hills, Toole County and Liberty County, Montana, 1994.

Scientific Name	Code	Common Name	Trad. Use
ACERACEAE			
Acer glabrum	Ace gla	Rocky Mountain maple	
Acer negundo	Ace neg	Box-elder	+
APIACEAE			
Angelica arguta	Ang arg	Sharptooth angelica	
Cicuta douglasii	Cic dou	Western water-hemlock	+
Heracleum lanatum	Her lan	Cow parsnip	+
Lomatium cous	Lom cou	Cous biscuit-root	+
Lomatium dissectum	Lom dis	Fern-leaved lomatium	+
Lomatium macrocarpum	Lom mac	Large-fruited lomatium	+
Lomatium triternatum	Lom tri	Nineleaf lomatium	+
Musineon divaricatum	Mus div	Leafy musineon	+
Osmorhiza depauperata	Osm dep	Blunt-fruited sweet-root	+
Perideridia gairdneri	Per gai	Yampa	+
Zizia aptera	Ziz apt	Heart-leaved Alexanders	+
APOCYNACEAE			
Apocynum androsaemifolium	Apo and	Spreading dogbane	+
ASTERACEAE			
Achillea millefolium	Ach mil	Common yarrow	+
Agoseris glauca	Ago gla	Pale agoseris	
Anaphalis margaritiçea	Ana mar	Pearly everlasting	+
Antennaria anaphaloides	Ant ana	Tall pussytoes	
Antennaria microphylla	Ant mic	Rose pussytoes	
Antennaria neglecta	Ant neg	Field pussytoes	
Antennaria parvifolia	Ant par	Small-leaf pussytoes	
Antennaria racemosa	Ant rac	Raceme pussytoes	
Antennaria umbrinella	Ant umb	Umber pussytoes	
Arnica cordifolia	Arn cor	Heartleaf arnica	
Arnica fulgens	Arn ful	Orange arnica	
Arnica sororia	Arn sor	Twin arnica	
Artemisia campestris	Art cam	Field sagewort	+
Artemisia dracunculus	Art dra	Tarragon	+

Artemisia frigida	Art fri	Fringed sagewort	+
Artemisia longifolia	Art lon	Long-leaved sage	
Artemisia ludoviciana	Art lud	Cudweed sagewort	+
Aster falcatus	Ast fal	Creeping white prairie aster	
Aster foliaceus	Ast fol	Leafybract aster	+
Aster occidentalis	Ast occ	Western mountain aster	
Aster pansus	Ast pan	Tufted white prairie aster	
Bahia oppositifolia	Bah opp	Bahia	
Balsamorhiza sagittata	Bal sag	Arrowleaf balsamroot	+
Centaurea maculosa	Cen mac	Spotted knapweed	
Chaenactis douglasii	Cha dou	Chaenactis	
Chrysanthemum leucanthemum	Chr leu	Daisy	
Cirsium arvense	Cir arv	Canada thistle	
Cirsium undulatum	Cir und	Wavyleaf thistle	
Cirsium vulgare	Cir vul	Bull thistle	
Crepis runcinata	Cre run	Dandelion hawksbeard	
Dyssodia papposa	Dys pap	Fetid marigold	+
Erigeron acris	Eri acr	Bitter fleabane	
Erigeron caespitosus	Eri cae	Tufted fleabane	
Erigeron compositus	Eri com	Fernleaf fleabane	
Erigeron corymbosus	Eri cor	Purple daisy fleabane	
Erigeron glabellus	Eri gla	Smooth daisy	
Erigeron pumilus	Eri pum	Shaggy fleabane	+
Erigeron simplex	Eri sim	Alpine daisy	
Erigeron speciosus	Eri spe	Showy fleabane	
Erigeron strigosus	Eri str	Daisy fleabane	
Gaillardia aristata	Gai ari	Common gaillardia	+
Grindelia squarrosa	Gri squ	Curlcup gumweed	+
Haplopappus spinulosus	Hap spi	Spiny goldenweed	
Helianthus nuttallii	Hel opp	Nuttall's sunflower	
Helianthus rigidus	Hel rig	Stiff sunflower	
Heterotheca villosa	Het vil	Hairy golden aster	
Heuchera parvifolia	Heu par	Littleleaf alumroot	+
Hieracium gracile	Hie gra	Slender hawkweed	
Hieracium umbellatum	Hie umb	Narrow-leaved hawkweed	
Hymenoxys acaulis	Hym aca	Stemless hymenoxys	
Liatris punctata	Lia pun	Blazing star	+
Rudbeckia serotina	Rat ser	Black-eyed susan	+
Senecio canus	Sen can	Woolly groundsel	
Senecio integerrimus	Sen int	Lambstongue groundsel	
Senecio streptanthifolius	Sen str	Rocky Mountain butterweed	
Solidago gigantea	Sol gig	Smooth goldenrod	
Solidago missouriensis	Sol mis	Missouri goldenrod	
Solidago multiradiata	Sol mul	Northern goldenrod	

Solidago nemoralis	Sol nem	Field goldenrod	
Solidago rigida	Sol rig	Stiff goldenrod	
Solidago spathulata	Sol spa	Dune goldenrod	
Sonchus arvensis	Son arv	Cow thistle	
Taraxacum officinale	Tar off	Common dandelion	+
Townsendia hoodii	Tow hoo	Hood's townsendia	
Townsendia parryi	Tow par	Parry's townsendia	
Tragopogon dubius	Tra dub	Common salsify	
BERBERIDACEAE			
Berberis repens	Ber rep	Creeping Oregon-grape	+
BORAGINACEAE			
Cryptantha celosioides	Cry cel	Miner's candle	
Hackelia deflexa	Hac def	Nodding stickseed	
Lappula redowski	Lap red	Western stickseed	
Lithospermum ruderale	Lit rud	Western gromwell	+
Mertensia viridis	Mer vir	Green bluebells	+
Plagiobothrys scouleri	Pla sco	Scouler's plagiobothrys	
BRASSICACEAE			
Alyssum alyssoides	Aly aly	Pale alyssum	
Arabis divaricarpa	Ara div	Spreading-pod rockcress	
Arabis glabra	Ara gla	Tower mustard	
Arabis hirsuta	Ara hir	Hairy rockcress	
Arabis holboellii	Ara hol	Holboell's rockcress	
Arabis lemmonii	Ara lem	Lemmon's rockcress	
Arabis nuttallii	Ara nut	Nuttall rockcress	
Barbarea orthoceras	Bar ort	American wintercress	
Berteroa incana	Ber inc	Berteroa	
Camelina microcarpa	Cam mic	Littlepod falseflax	
Camelina sativa	Cam sat	Falseflax	
Capsella bursa-pastoris	Cap bur	Shepherd's-purse	
Cardamine oligosperma	Car oli	Little western bittercress	
Descurainia pinnata	Des pin	Pinnate tansymustard	
Descurainia richardsonii	Des ric	Mountain tansymustard	
Draba aurea	Dra aur	Golden draba	
Draba nemorosa	Dra nem	Woods draba	
Draba oligosperma	Dra oli	Few-seeded draba	
Erysimum cheiranthoides	Ery che	Treacle mustard	
Erysimum inconspicuum	Ery inc	Small wallflower	
Halimolobos virgata	Hal vir	Twiggy halimolobos	
Lepidium densiflorum	Lep den	Prairie pepperweed	
Lesquerella alpina	Les alp	Alpine bladderpod	

Sisymbrium altissimum	Sis alt	Tumblemustard	
Thlaspi arvense	Thl arv	Fanweed	
CALLITRICHACEAE			
Callitriche pallustris	Cal pal	Spring water-starwort	
CAMPANULACEAE			
Campanula parryi (?)	Cam par	Parry's harebell	
Campanula rotundifolia	Cam rot	Roundleaf harebell	
CAPRIFOLIACEAE			
Linnaea borealis	Lin bor	Western twinflower	+
Symphoricarpos albus	Sym alb	Common snowberry	+
Symphoricarpos occidentalis	Sym occ	Western snowberry	+
CARYOPHYLLACEAE			
Arenaria congesta	Are con	Ballhead sandwort	
Arenaria lateriflora	Are lat	Bluntleaf sandwort	
Arenaria rubella	Are rub	Reddish sandwort	
Cerastium arvense	Cer arv	Field chickweed	
Lychnis alba	Lyc alb	White campion	
Lychnis drummondii	Lyc dru	Drummond campion	
Silene antirhina	Sil ant	Sleepy catchfly	
Silene parryi	Sil par	Parry's silene	
Stellaria calycantha	Ste cal	Northern starwort	
Stellaria longifolia	Ste lon	Long-leaved starwort	
CHENOPODIACEAE			
Chenopodium album	Che alb	Lambsquarter goosefoot	+
Chenopodium leptophyllum	Che lep	Narrow goosefoot	
Monolepis nuttalliana	Mon nut	Patata	
CORNACEAE			
Cornus canadensis	Cor can	Bunchberry dogwood	
Cornus stolonifera	Cor sto	Red osier dogwood	+
CRASSULACEAE			
Sedum lanceolatum	Sed lan	Lanceleaf stonecrop	
CUPRESSACEAE			
Juniperus communis	Jun com	Common juniper	+
Juniperus horizontalis	Jun hor	Creeping juniper	+
Juniperus scopulorum	Jun sco	Rocky Mountain juniper	+

CYPERACEAE			
Carex albonigra	Car alb	Black-and-white scaled sedge	
Carex aquatilis	Car aqu	Water sedge	
Carex athrostachya	Car ath	Slenderbeaked sedge	
Carex atrata	Car atr	Blackened sedge	
Carex aurea	Car aur	Golden sedge	
Carex brevior	Car bre	Short-beaked sedge	
Carex capillaris	Car cap	Hair sedge	
Carex eleocharis	Car ele	Needleleaf sedge	
Carex filifolia	Car fil	Threadleaf sedge	
Carex geyeri	Car gey	Elk sedge	
Carex hoodii	Car hoo	Hood's sedge	
Carex hystricina (?)	Car hys	Porcupine sedge	
Carex microptera	Car mic	Smallwing sedge	
Carex nebrascensis	Car neb	Nebraska sedge	
Carex obtusata	Car obt	Blunt sedge	
Carex parryana	Car par	Parry sedge	
Carex pensylvanica	Car pen	Sun sedge	
Carex petasata	Car pet	Liddon sedge	
Carex phaeocephala	Car pha	Dunhead sedge	
Carex raynoldsii	Car ray	Raynold's sedge	
Carex rossii	Car ros	Ross' sedge	
Carex siccata	Car sic	Silvertop sedge	
Carex sprengelii	Car spr	Sprengel's sedge	
Carex utriculata	Car utr	Beaked sedge	
Carex xerantica	Car xer	Dryland sedge	
ERICACEAE			
Arctostaphylos uva-ursi	Arc uva	Kinikinnick	+
Chimaphila umbellata	Chi umb	Prince's pine	
Monotropa uniflora	Mon uni	Indian pipe	
Pyrola asarifolia	Pry asa	Common pink wintergreen	
Pyrola secunda	Pyr sec	Sidebells pyrola	
Pyrola uniflora	Pyr uni	Woodnymph	
Pyrola virens	Pyr vir	Green-flowered wintergreen	
Vaccinium caespitosum	Vac cae	Dwarf huckleberry	
Vaccinium membranaceum	Vac mem	Thinleaf huckleberry	+
Vaccinium myrtillus	Vac myr	Dwarf bilberry	
Vaccinium scoparium	Vac sco	Grouse whortleberry	+
ELAEAGNACEAE			
Elaeagnus argentea	Ele arg	Silverberry	
Shepherdia canadensis	She can	Canada buffaloberry	+

Carex albonigra	Car alb	Black-and-white scaled sedge	
Carex aquatilis	Car aqu	Water sedge	
Carex athrostachya	Car ath	Slenderbeaked sedge	
Carex atrata	Car atr	Blackened sedge	
Carex aurea	Car aur	Golden sedge	
Carex brevior	Car bre	Short-beaked sedge	
Carex capillaris	Car cap	Hair sedge	
Carex eleocharis	Car ele	Needleleaf sedge	
Carex filifolia	Car fil	Threadleaf sedge	
Carex geyeri	Car gey	Elk sedge	
Carex hoodii	Car hoo	Hood's sedge	
Carex hystricina (?)	Car hys	Porcupine sedge	
Carex microptera	Car mic	Smallwing sedge	
Carex nebrascensis	Car neb	Nebraska sedge	
Carex obtusata	Car obt	Blunt sedge	
Carex parryana	Car par	Parry sedge	
Carex pensylvanica	Car pen	Sun sedge	
Carex petasata	Car pet	Liddon sedge	
Carex phaeocephala	Car pha	Dunhead sedge	
Carex raynoldsii	Car ray	Raynold's sedge	
Carex rossii	Car ros	Ross' sedge	
Carex siccata	Car sic	Silvertop sedge	
Carex sprengelii	Car spr	Sprengel's sedge	
Carex utriculata	Car utr	Beaked sedge	
Carex xerantica	Car xer	Dryland sedge	
ERICACEAE			
Arctostaphylos uva-ursi	Arc uva	Kinikinnick	+
Chimaphila umbellata	Chi umb	Prince's pine	
Monotropa uniflora	Mon uni	Indian pipe	
Pyrola asarifolia	Pry asa	Common pink wintergreen	
Pyrola secunda	Pyr sec	Sidebells pyrola	
Pyrola uniflora	Pyr uni	Woodnymph	
Pyrola virens	Pyr vir	Green-flowered wintergreen	
Vaccinium caespitosum	Vac cae	Dwarf huckleberry	
Vaccinium membranaceum	Vac mem	Thinleaf huckleberry	+
Vaccinium myrtillus	Vac myr	Dwarf bilberry	
Vaccinium scoparium	Vac sco	Grouse whortleberry	+
ELAEAGNACEAE			
Elaeagnus argentea	Ele arg	Silverberry	
Shepherdia canadensis	She can	Canada buffaloberry	+

EUPHORBIACEAE			
Euphorbia esula	Eup esu	Leafy spurge	
EQUISETACEAE			
Equisetum arvense	Equ arv	Common horsetail	+
Equisetum laevigatum	Equ lae	Smooth scouring-rush	+
FABACEAE			
Astragalus aboriginum	Ast abo	Indian milkvetch	
Astragalus adsurgens	Ast ads	Prairie milkvetch	+
Astragalus agrestis	Ast agr	Purple milkvetch	
Astragalus bisulcatus	Ast bis	Two-groove milkvetch	+
Astragalus crassicarpus	Ast cra	Ground plum	+
Astragalus drummondii	Ast dru	Drummond milkvetch	
Astragalus vexilliflexus	Ast vex	Bent-flowered milkvetch	
Glycyrrhiza lepidota	Gly lep	Wild licorice	+
Hedysarum alpinum	Hed alp	American sweetvetch	
Hedysarum sulphurescens	Hed sul	Yellow sweetvetch	
Lathyrus ochroleucus	Lat och	Cream peavine	
Lupinus argenteus	Lup arg	Silvery lupine	
Lupinus lepidus	Lup lep	Prairie lupine	
Melilotus officinalis	Mel off	Yellow sweetclover	+
Trifolium pratense	Tri pra	Red clover	
Trifolium repens	Tri rep	White clover	
Oxytropis lagopus (?)	Oxy lag	Haresfoot loco	
Oxytropis sericea	Oxy ser	White point loco	
Oxytropis splendens	Oxy spl	Showy crazyweed	+
Thermopsis rhombifolia	The rho	Round-leaved thermopsis	
Vicia americana	Vic ame	American vetch	
FUMARIACEAE			
Corydalis aurea	Cor aur	Golden corydalis	
GENTIANACEAE			
Gentianella amarella	Gen ama	Northern gentian	
GERANIACEAE			
Geranium bicknellii	Ger bic	Bicknell's geranium	
Geranium richardsonii	Ger ric	Richardson geranium	+
Geranium viscosissimum	Ger vis	Sticky geranium	
GROSSULARIACEAE			
Ribes setosum	Rib set	Redshoot gooseberry	+

HYDROPHYLLACEAE				
Ellisia nyctelea	Ell	nyc	Nyctelea	
Phacelia sericea	Pha	ser	Silky phacelia	
IRIDACEAE				
Sisyrinchium angustifolium	Sis	ang	Blue-eyed grass	
JUNCACEAE				
Juncus balticus	Jun	bal	Wire rush	+
Juncus castaneus	Jun	cas	Chestnut rush	
Juncus ensifolius	Jun	ens	Dagger-leaf rush	
Juncus nevadensis	Jun	nev	Sierra rush	
Juncus tenuis	Jun	ten	Slender rush	
Luzula campestris	Luz	cam	Sweep's brush	
Luzula spicata	Luz	spi	Spiked woodrush	
LAMIACEAE				
Monarda fistulosa	Mon	fis	Horsemint	+
LILIACEAE				
Allium cernuum	All	cer	Nodding onion	+
Allium textile	All	tex	Textile onion	+
Disporum trachycarpum	Dis	tra	Rough-fruited fairy-bells	+
Fritillaria pudica	Fri	pud	Yellowbells	+
Smilacina racemosa	Smi	rac	Feather solomon's seal	+
Smilacina stellata	Smi	ste	Starry false solomon's seal	
Zigadenus elegans	Zig	ele	Glaucous zigadenus	+
Zigadenus venenosus	Zig	ven	Meadow death camas	+
LINACEAE				
Linum perenne	Lin	per	Blue flax	+
LORANTHACEAE				
Arceuthobium americanum	Arc	ame	American dwarf	+
ONAGRACEAE				
Epilobium alpinum	Epi	alp	Alpine willow-herb	
Epilobium angustifolium	Epi	ang	Fireweed	+
Epilobium ciliatum	Epi	cil	Common willow herb	
Epilobium paniculatum	Epi	pan	Autumn willow herb	
Gaura coccinea	Gau	coc	Scarlet gaura	
Oenothera cespitosa	Oen	ces	Tufted evening primrose	
Oenothera villosa	Oen	vil	Rydberg's evening primrose	

OPHIOGLOSSACEAE			
Botrychium lunaria	Bot lun	Moonwort	
ORCHIDACEAE			
Calypso bulbosa	Cal bul	Fairy-slipper	
Corallorhiza maculata	Cor mac	Spotted coral-root	
Corallorhiza trifida	Cor tri	Early coral-root	
Habenaria hyperborea	Hab hyp	Green bog-orchid	
OROBANCHACEAE			
Orobanche fasciculata	Oro fas	Clustered broomrape	
PINACEAE			
Abies lasiocarpa	Abi las	Subalpine fir	+
Picea engelmannii x glauca	Pic eng	Engelmann spruce x White spruce	+
Pinus albicaulis	Pin alb	Whitebark pine	+
Pinus contorta	Pin con	Lodgepole pine	+
Pinus flexilis	Pin fle	Limber pine	+
Pseudotsuga menziesii	Pse men	Douglas-fir	+
PLANTAGINACEAE			
Plantago major	Pla maj	Common plantain	+
POACEAE			
Agropyron caninum	Agr can	Slender wheatgrass	
Agropyron dasystachyum	Agr das	Thickspike	
Agropyron repens	Agr rep	Quackgrass	
Agropyron spicatum	Agr spi	Bluebunch wheatgrass	
Agrostis scabra	Agr sca	Rough bentgrass	
Agrostis thurberiana	Agr thu	Thurber bentgrass	
Alopecurus aequalis	Alo aeq	Shortawn foxtail	
Bouteloua gracilis	Bou gra	Blue grama	
Bromus carinatus	Bro car	California brome	
Bromus ciliatus	Bro cil	Fringed brome	
Bromus inermis	Bro ine	Smooth brome wheatgrass	
Bromus pumpellianus	Bro pum	Pumpelly brome	
Bromus tectorum	Bro tec	Cheatgrass	
Bromus vulgaris	Bro vul	Narrow-flowered brome	
Calamagrostis canadensis	Cal can	Bluejoint reedgrass	
Calamagrostis purpurascens	Cal pur	Purple reedgrass	
Calamagrostis rubescens	Cal rub	Pinegrass	
Catabrosa aquatica	Cat aqu	Brookgrass	
Dactylis glomerata	Dac glo	Orchard grass	

Danthonia californica	Dan	cal	California oatgrass	
Danthonia intermedia	Dan	int	Timber oatgrass	
Danthonia unispicata	Dan	uni	Onespike danthonia	
Deschampsia cespitosa	Des	ces	Tufted hairgrass	
Festuca idahoensis	Fes	ida	Idaho fescue	
Festuca ovina	Fes	ovi	Sheep fescue	
Festuca pratensis	Fes	pra	Meadow fescue	
Festuca scabrella	Fes	sca	Rough fescue	
Glyceria striata	Gly	str	Fowl mannagrass	
Helictotrichon hookeri	Hel	hoo	Spike-oat	
Hierochloe odorata	Hie	odo	Sweetgrass	+
Hordeum brachyantherum	Hor	bra	Meadow barley	
Hordeum jubatum	Hor	jub	Foxtail barley	
Koeleria cristata	Koe	cri	Prairie junegrass	
Phleum alpinum	Phl	alp	Alpine timothy	
Phleum pratense	Phl	pra	Common timothy	
Poa alpina	Poa	alp	Alpine bluegrass	
Poa compressa	Poa	com	Canada bluegrass	
Poa cusickii	Poa	cus	Cusick bluegrass	
Poa fendleriana	Poa	fen	Mutton-grass	
Poa interior	Poa	int	Inland bluegrass	
Poa juncifolia	Poa	jun	Big bluegrass	
Poa nervosa	Poa	ner	Wheeler's bluegrass	
Poa palustris	Poa	pal	Fowl bluegrass	
Poa pratensis	Poa	pra	Kentucky bluegrass	
Poa scabrella	Poa	sca	Pine bluegrass	
Poa rupicola	Poa	rup	Timberline bluegrass	
Poa sandbergii	Poa	san	Native bluegrass	
Stipa comata	Sti	com	Needle-and-thread	+
Stipa occidentalis	Sti	occ	Columbia needlegrass	
Stipa viridula	Sti	vir	Green needlegrass	
Trisetum canescens	Tri	can	Tall trisetum	
POLEMONIACEAE				
Collomia linearis	Col	lin	Narrow-leaved collomia	
Ipomopsis congesta	Ipo	con	Ballhead gilia	
Phacelia linearis	Pha	lin	Linearleaf phacelia	
Phlox alyssifolia	Phl	aly	Alyssum-leaved phlox	
Phlox hoodii	Phl	hoo	Hood's phlox	
Polemonium pulcherrimum	Pol	pul	Showy polemonium	
Polemonium viscosum	Pol	vis	Sticky polemonium	
POLYGONACEAE				
Eriogonum flavum	Eri	fla	Yellow buckwheat	
Eriogonum umbellatum	Eri	umb	Sulfur buckwheat	+

Polygonum aviculare	Pol avi	Knotweed	
Polygonum bistortoides	Pol bis	American bistort	+
Polygonum douglasii	Pol dou	Douglas knotweed	
Rumex acetosa	Rum ace	Garden sorrel	+
Rumex acetosella	Rum ace	Sheep sorrel	
Rumex crispus	Rum cri	Yellow dock	
Rumex occidentalis	Rum occ	Western dock	
Rumex salicifolius	Rum sal	Willowleaved dock	
POLYPODIACEAE			
Athyrium felix-femina	Ath fel	Lady fern	
Cheilanthes feei	Che fee	Lip fern	
Cystopteris fragilis	Cys fra	Brittle bladderfern	
Woodsia oregana	Woo ore	Woodsia	
PORTALUCACEAE			
Claytonia lanceolata var. flava	Cla lan	Springbeauty	+
PRIMULACEAE			
Androsace septentrionalis	And sep	Northern rockjasmine	
Dodecatheon conjugens	Dod con	Shooting star	
Dodecatheon pulchellum	Dod pul	Few-flowered shooting star	
Glaux maritima	Gla mar	Saltwort	
RANUNCULACEAE			
Actaea rubra	Act rub	Red baneberry	+
Anemone multifida	Ane mul	Ball anemone	
Anemone patens	Ane pat	Pasqueflower	+
Delphinium bicolor	Del bic	Low larkspur	
Ranunculus abortivus	Ran abo	Smallflower buttercup	
Ranunculus acris	Ran acr	Meadow buttercup	
Ranunculus aquatilis	Ran aqu	Watercrowfoot buttercup	
Ranunculus cardiophyllus	Ran car	Heart-leaved buttercup	
Ranunculus cymbalaria	Ran cym	Shore buttercup	
Ranunculus eschschlotzii	Ran esc	Eschscholtz' buttercup	
Ranunculus glaberrimus	Ran gla	Sagebrush buttercup	
Ranunculus inamoenus	Ran ina	Unlovely buttercup	
Ranunculus macounii	Ran mac	Macoun's buttercup	
Ranunculus pedatifidus	Ran ped	Birdsfoot buttercup	
Ranunculus sceleratus	Ran sce	Blister buttercup	
Ranunculus uncinatus	Ran unc	Little buttercup	
Thalictrum occidentale	Tha occ	Western meadowrue	
Thalictrum venulosum	Tha ven	Veiny meadowrue	

RHAMNACEAE			
Ceanothus velutinus	Cea vel	Snowbrush ceanothus	+
ROSACEAE			
Amelanchier alnifolia	Ame aln	Western serviceberry	+
Chamaerhodos erecta	Cha ere	Chamaerhodos	
Clematis columbiana	Cle col	Rock clematis	
Clematis tenuiloba	Cle ten	Matted purple clematis	
Crataegus douglasii	Cra dou	Black hawthorn	+
Fragaria virginiana	Fra vir	Virginia strawberry	+
Geum aleppicum	Geu ale	Yellow avens	
Geum macrophyllum	Geu mac	Large-leaved avens	
Geum rivale	Geu riv	Purple avens	
Geum rossii	Geu ros	Ross' avens	
Geum triflorum	Geu tri	Prairiesmoke	
Potentilla anserina	Pot ans	Common silverweed	
Potentilla arguta	Pot arg	Tall cinquefoil	
Potentilla diversifolia	Pot div	Diverse-leaved cinquefoil	
Potentilla fruticosa	Pot fru	Shrubby cinquefoil	+
Potentilla glandulosa	Pot gla	Glandular cinquefoil	
Potentilla gracilis	Pot gra	Northwest cinquefoil	
Potentilla hippiana	Pot hip	Horse cinquefoil	
Potentilla pensylvanica	Pot pen	Prairie cinquefoil	
Potentilla rivalis	Pot riv	Brook cinquefoil	
Prunus virginiana	Pru vir	Common chokecherry	+
Rosa acicularis (?)	Ros aci	Prickly rose	+
Rosa arkansana	Ros ark	Prairie rose	+
Rosa woodsii	Ros woo	Wood's rose	+
Rubus idaeus	Rub ida	Red raspberry	+
Sibbaldia procumbens	Sib pro	Creeping sibbaldia	
Spiraea betulifolia	Spi bet	White spirea	
RUBIACEAE			
Galium boreale	Gal bor	Northern bedstraw	+
SALICACEAE			
Populus tremuloides	Pop tre	Quaking aspen	+
Populus trichocarpa	Pop tri	Black cottonwood	+
Salix bebbiana	Sal beb	Bebb willow	+
Salix brachycarpa	Sal bra	Short-fruited willow	+
Salix exigua	Sal exi	Slender willow	+
Salix lutea	Sal lut	Yellow willow	+
Salix planifolia	Sal pla	Tea-leaved willow	+

SANTALACEAE			
Comandra umbellata	Com umb	Pale bastard toadflax	
SAXIFRAGACEAE			
Conimitella williamsii	Con wil	Conimitella	
Lithophragma parviflora	Lit par	Smallflower woodland star	
Parnassia palustris	Par pal	Northern grass-of-parnassus	
Saxifraga bronchialis	Sax bro	Matted saxifrage	
Saxifraga cernua	Sax cer	Nodding saxifrage	
Saxifraga occidentalis	Sax occ	Western saxfrage	
SCROPHULARIACEAE			
Besseya wyomingensis	Bes wyo	Kittentail	
Castilleja cusickii	Cas cus	Cusick's paintbrush	
Castilleja lutescens	Cas lut	Yellow paintbrush	
Castilleja miniata	Cas min	Scarlet paintbrush	
(Castilleja rhexilifolia	deleted)		
Collinsia parviflora	Col par	Blue-eyed Mary	
Mimulus guttatus	Mim gut	Common monkey flower	
Orthocarpus luteus	Ort lut	Yellow owl-clover	
Penstemon confertus	Pen con	Yellow penstemon	
Penstemon nitidus	Pen nit	Waxleaf penstemon	
Penstemon procerus	Pen pro	Littleleaf penstemon	
Veronica americana	Ver ame	American speedwell	
Veronica peregrina	Ver per	Purslane speedwell	
Veronica serpyllifolia	Ver ser	Thyme-leaved speedwell	
SELAGINACEAE			
Selaginella densa	Sel den	Compact clubmoss	
SOLANACEAE			
Solanum triflorum	Sol tri	Cut-leaved nightshade	+
URTICACEAE			
Urtica dioica	Urt dio	Stinging nettle	+
VIOLACEAE			
Viola adunca	Vio adu	Western violet	
Viola canadensis	Vio can	Canada violet	
Viola nuttallii	Vio nut	Nuttall violet	

Scientific nomenclature follows Hitchcock and Cronquist (1973) and Hitchcock et al. (1955-1969), in addition to Dorn (1984). Common names were mostly taken from these sources. This same list is available in the format presented in Western Technology and Engineering, Inc., broken down in native and non-native species by class.

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